

## DESCRIPTION

Demonstration circuit 561 is a high current step-down PolyPhase™ converter featuring the LTC®3731 three-phase synchronous buck controller. To minimize the supply footprint size and improve the thermal performance, the 5mm x 5mm QFN package LTC3731CUH controller is used. The switching frequency of the LTC3731 is in the 250kHz to 600kHz range. The input voltage is from 10V to 14V and output is 1.5V. An optional VID controller circuit is available on both DC561A-A and DC561A-B demo circuits for output voltage programming. DC561A-A can provide up to 180A output current with a 12-phase buck circuit, while DC561A-B is a 6-phase buck converter

with up to 90A output current. Optional 0.1% external voltage reference and external OP-AMP compensation circuits are also available on DC561A-A and DC561A-B for accurate voltage regulation and best transient response. Additional MOSFETs can be populated for higher output current.

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

LTC is a trademark of Linear Technology Corporation

**Table 1. Performance Summary ( $T_A = 25^\circ\text{C}$ )**

PARAMETER	CONDITION	VALUE
Minimum Input Voltage		10V
Maximum Input Voltage		14V
$V_{OUT}$	DC561A-A: $I_{OUT} = 0\text{A to } 180\text{A}$ DC561A-B: $I_{OUT} = 0\text{A to } 90\text{A}$	$1.5\text{V} \pm 1\%$
Nominal Switching Frequency	Set by resistor divider on demo circuit	450kHz
Typical Efficiency	DC561A-A: $V_{IN} = 12\text{V}, V_{OUT} = 1.5\text{V}, I_{OUT} = 180\text{A}$ DC561A-B: $V_{IN} = 12\text{V}, V_{OUT} = 1.5\text{V}, I_{OUT} = 90\text{A}$	83% 84%

## QUICK START PROCEDURE

Demonstration circuit 561 is easy to set up to evaluate the performance of the LTC3731. Refer to Figure 2. For proper measurement equipment setup and follow the procedure below:

1. Preset the following jumpers on the demo circuit: JP1-Int Prog, JP2-Off, JP4-Off, JP9-Int. and JP10-On. With above jumper setup, the supply is running at about 450kHz phase frequency, and using the on board +5V bias supply.
2. Preset the voltage of the input power supply to be 12V. Preset the current limit of the input power supply to be greater than 30A for DC561A-A or 15A

for DC561A-B. With power off, connect the input power supply to  $V_{in}$  and GND.

3. Connect the electronic load to  $V_{out+}$  and  $V_{out-}$ . Preset the load current to be 0A.
4. Turn on the power at the input.
5. Check for the proper output voltages at no load and full load (180A for DC561A-A and 90A for DC561A-B).  $V_{out} = 1.485\text{V to } 1.515\text{V}$ . A cooling fan is needed if the load current is higher than 50% of the full rated load current.

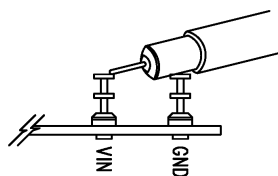
# QUICK START GUIDE FOR DEMONSTRATION CIRCUIT 561A

## 6-PHASE 90A / 12-PHASE 180A HIGH EFFICIENCY POWER SUPPLY

---

6. Adjust the loads within the operating range and observe the output voltage regulation, efficiency and other parameters.
7. (Optional) To perform the load transient test, set jumpers JP4-On and JP2-On. Use coaxial cables to

connect LOAD STEP and Vout+ coaxial outputs to oscilloscope inputs. Adjust R81 and R75 for desired load current step and rising slope. Adjust R73 for desired load current falling slope.



**Figure 1. Scope Probe Placement for Measuring Input or Output Ripple**

# QUICK START GUIDE FOR DEMONSTRATION CIRCUIT 561A

## 6-PHASE 90A / 12-PHASE 180A HIGH EFFICIENCY POWER SUPPLY

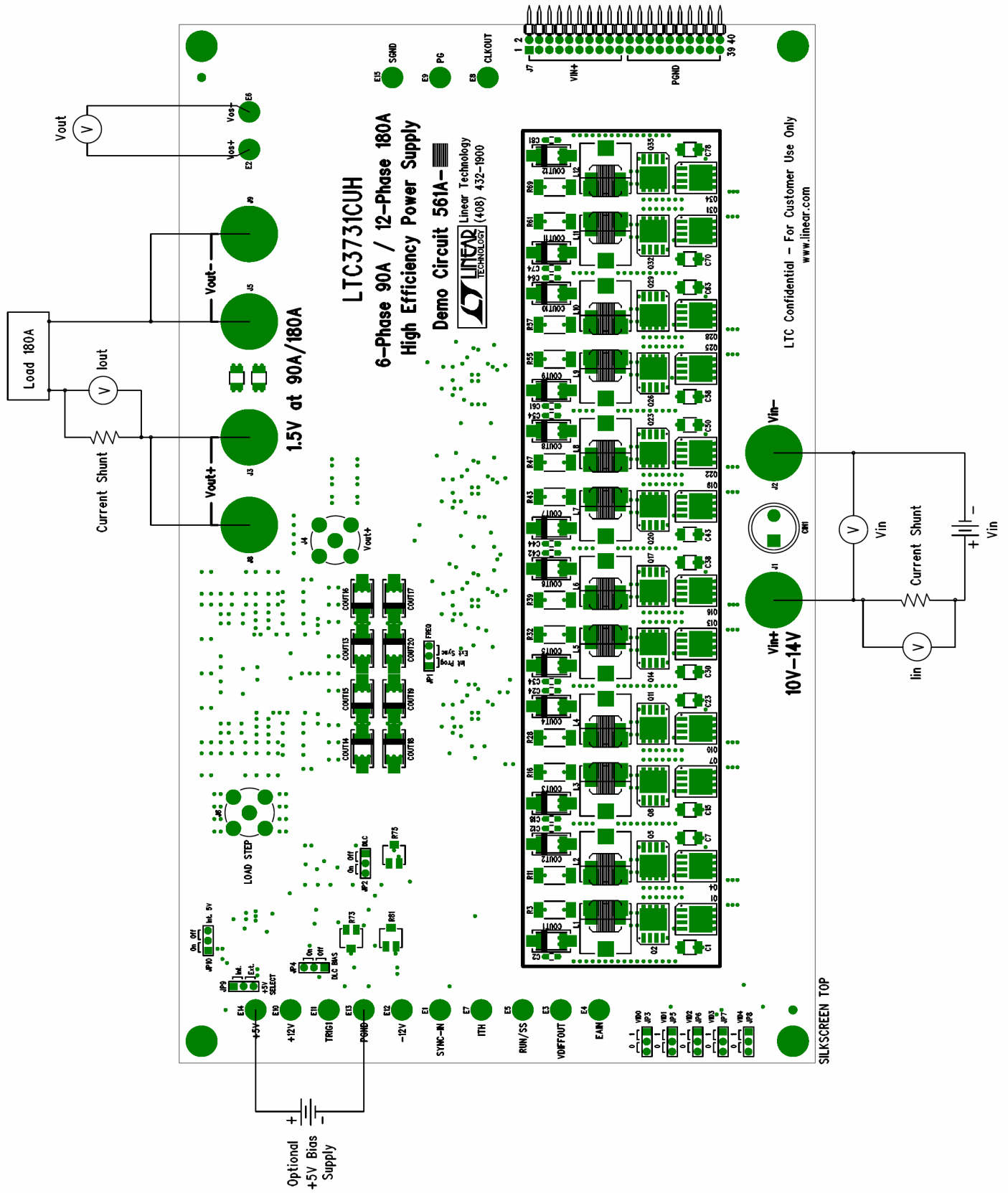
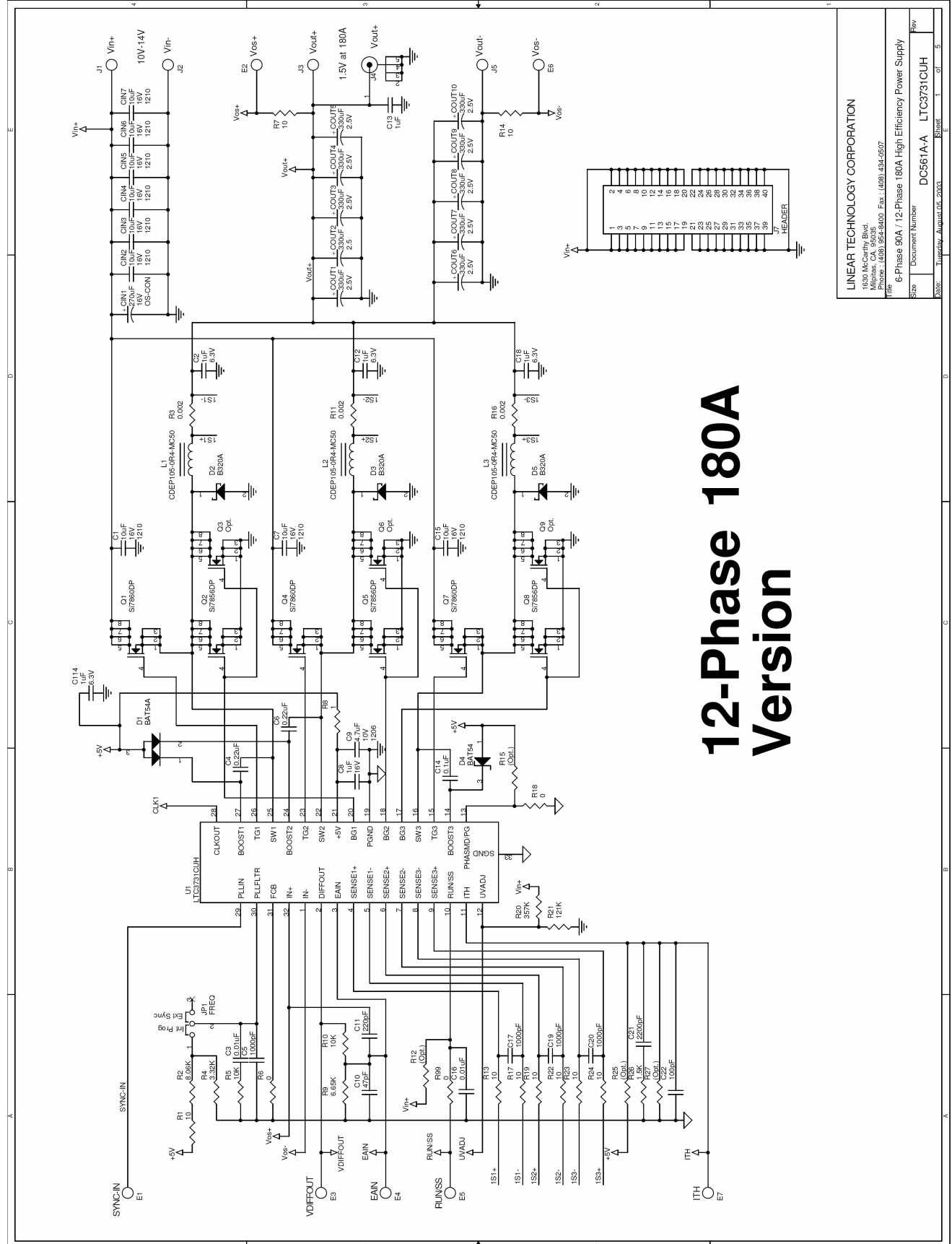


Figure 2. Proper Measurement Equipment Setup

# QUICK START GUIDE FOR DEMONSTRATION CIRCUIT 561A

## 6-PHASE 90A / 12-PHASE 180A HIGH EFFICIENCY POWER SUPPLY



# 12-Phase 180A Version

LINEAR TECHNOLOGY CORPORATION

1850 McCarthy Blvd.  
Folsom, CA 95630  
Phone: (408) 554-8200 Fax: (408) 434-6507

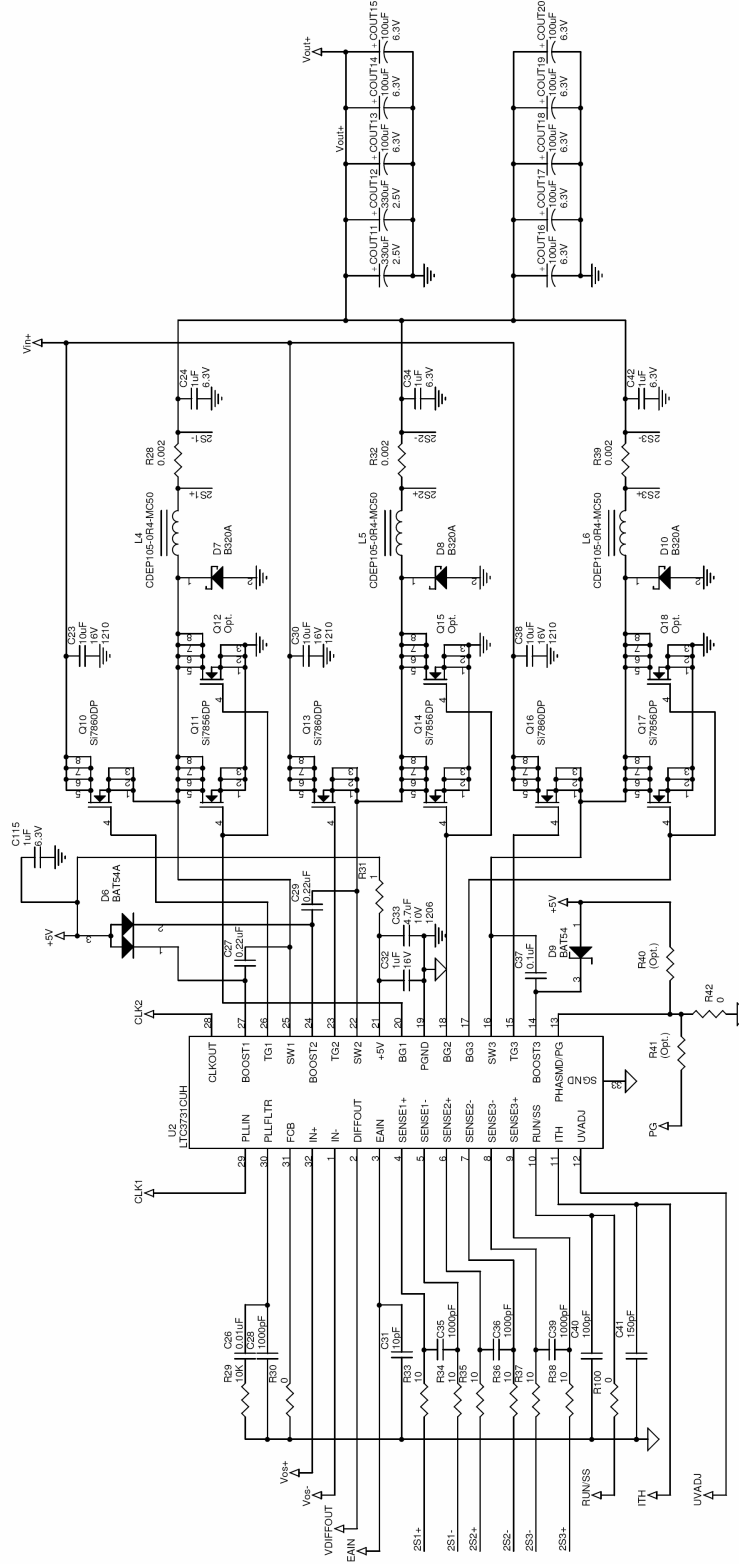
Title: 6-Phase 90A / 12-Phase 180A High Efficiency Power Supply

Size: Document Number DC561A-A LTC3731CUH Rev

3300: Tuesday, August 05, 2003 Sheet 1 of 5

# QUICK START GUIDE FOR DEMONSTRATION CIRCUIT 561A

## 6-PHASE 90A / 12-PHASE 180A HIGH EFFICIENCY POWER SUPPLY



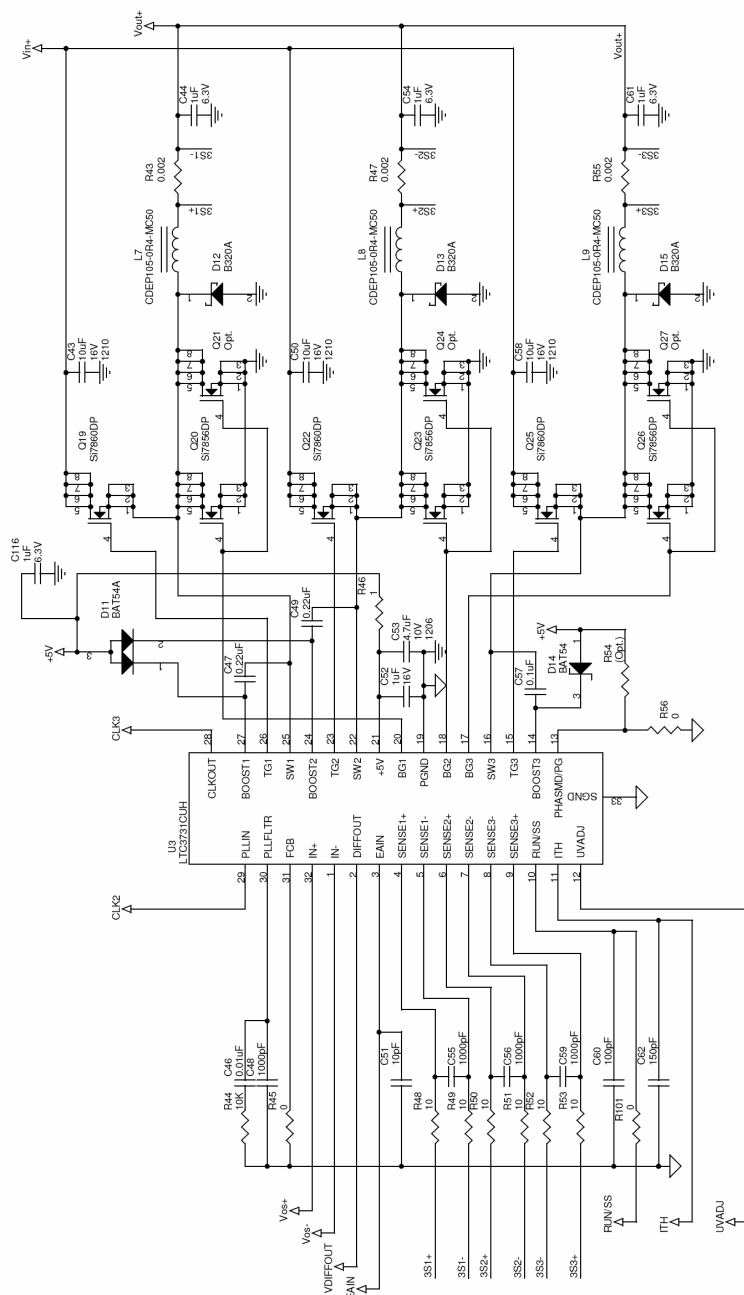
LINEAR TECHNOLOGY CORPORATION  
 1630 McCarty Blvd.  
 Milpitas, CA 95035  
 Phone: (408) 292-6400 Fax: (408) 434-6677  
 File: 6-Phase 90A / 12-Phase 180A High Efficiency Power Supply

Document Number: DC561A-A LTC3731CUH

Size: \_\_\_\_\_ of \_\_\_\_\_  
 Sheet: 2 of 5

# QUICK START GUIDE FOR DEMONSTRATION CIRCUIT 561A

## 6-PHASE 90A / 12-PHASE 180A HIGH EFFICIENCY POWER SUPPLY



LINEAR TECHNOLOGY CORPORATION

1630 McCarthy Blvd.  
Milpitas, CA 95035

Phone: (408) 252-2900 Fax: (408) 424-6507

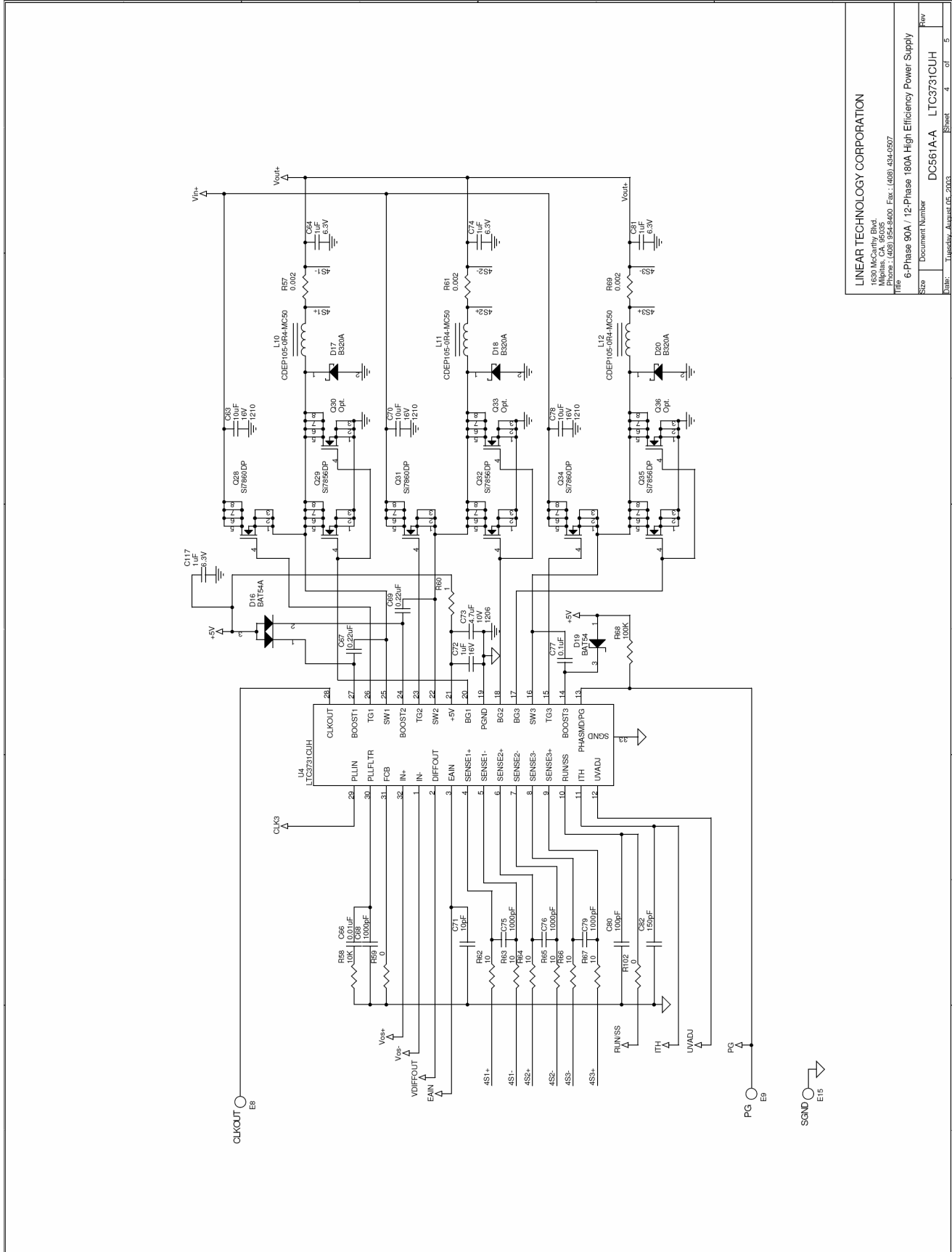
Title: 6-Phase 90A / 12-Phase 180A High Efficiency Power Supply

Size: Document Number DC561A-A LTC3731CUH Rev

Date: Tuesday, August 05, 2003 Sheet 3 of 5

# QUICK START GUIDE FOR DEMONSTRATION CIRCUIT 561A

## 6-PHASE 90A / 12-PHASE 180A HIGH EFFICIENCY POWER SUPPLY



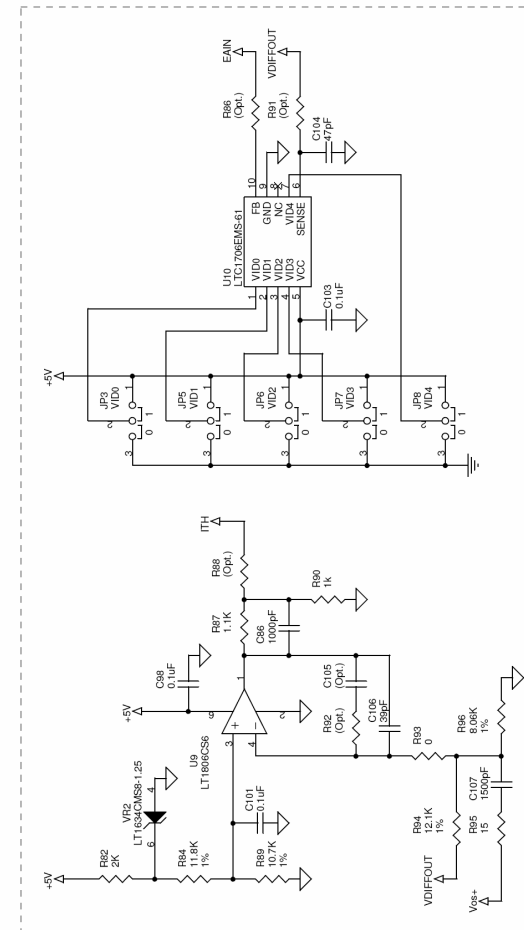
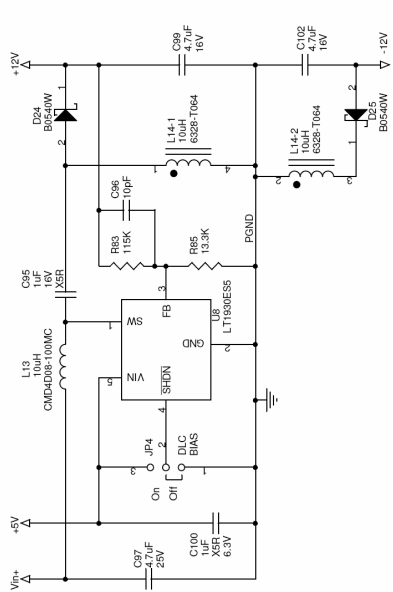
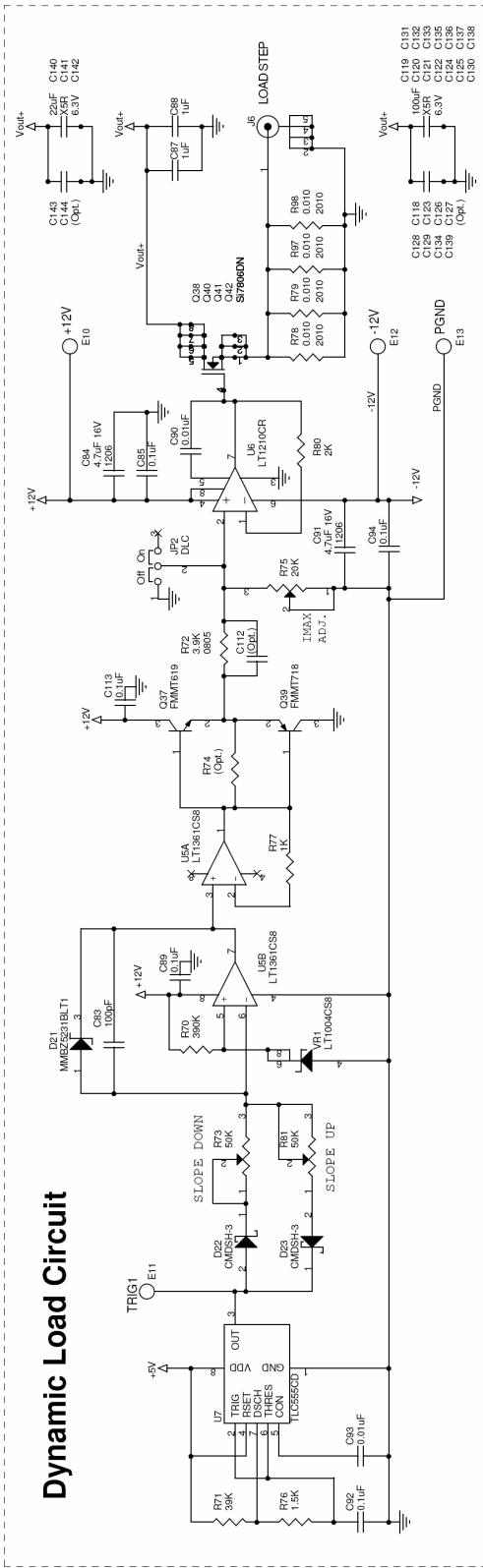
LINEAR TECHNOLOGY CORPORATION  
 1630 McCarthy Blvd.  
 Milpitas, CA 95035  
 Telephone: (408) 299-2000 Fax: (408) 424-6907  
 Title: 6-Phase 90A / 12-Phase 180A High Efficiency Power Supply

Document Number: DC561A-A LTC3731CUH Rev  
 Size: 4 of 5  
 Date: Tuesday, August 16, 2005 Sheet: 4 of 5

# QUICK START GUIDE FOR DEMONSTRATION CIRCUIT 561A

## 6-PHASE 90A / 12-PHASE 180A HIGH EFFICIENCY POWER SUPPLY

### Dynamic Load Circuit



### Optional External Compensation and Voltage Programming Circuit

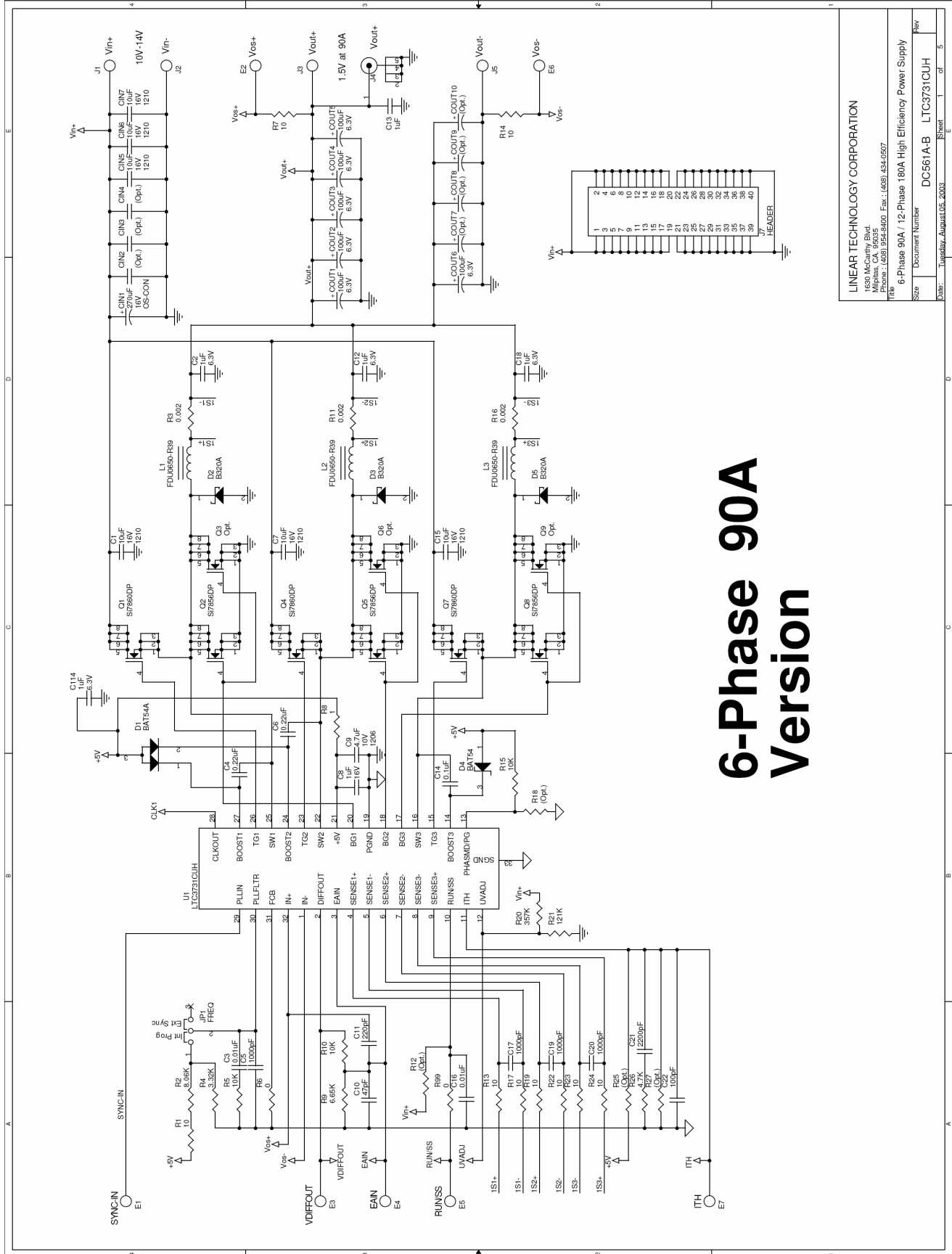
LINEAR TECHNOLOGY CORPORATION  
 1630 McCarthy Blvd.  
 Milpitas, CA 95035  
 Phone: (408) 299-6000 Fax: (408) 434-6507  
 Title: 6-Phase 90A / 12-Phase 180A High Efficiency Power Supply

Document Number: DC561A-A LTC3731QUH Rev. 5 of 5



# QUICK START GUIDE FOR DEMONSTRATION CIRCUIT 561A

## 6-PHASE 90A / 12-PHASE 180A HIGH EFFICIENCY POWER SUPPLY



# 6-Phase 90A Version

LINEAR TECHNOLOGY CORPORATION  
 1630 McCully Blvd.  
 Milpitas, CA, 95035  
 Phone: (408) 954-6000 Fax: (408) 434-0907

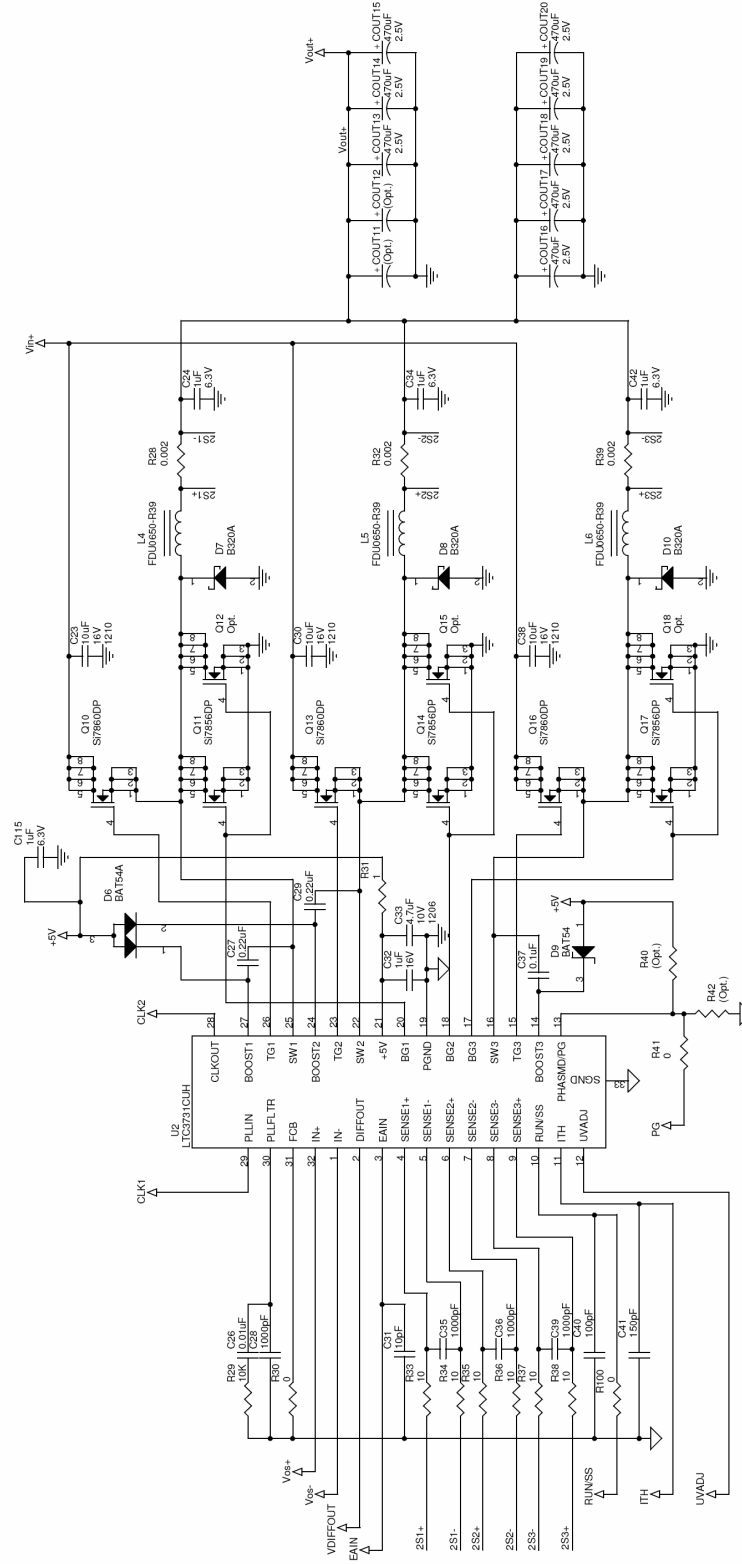
Title: 6-Phase 90A / 12-Phase 180A High Efficiency Power Supply

Size	Document Number	DC-561A-B	LTC3731CUH	Rev
Date:	August 05, 2003			

Sheet 1 of 5

# QUICK START GUIDE FOR DEMONSTRATION CIRCUIT 561A

## 6-PHASE 90A / 12-PHASE 180A HIGH EFFICIENCY POWER SUPPLY



LINEAR TECHNOLOGY CORPORATION  
 1630 McCarthy Blvd.  
 Milpitas, CA 95035  
 Tel: (408) 292-9600 Fax: (408) 434-6507

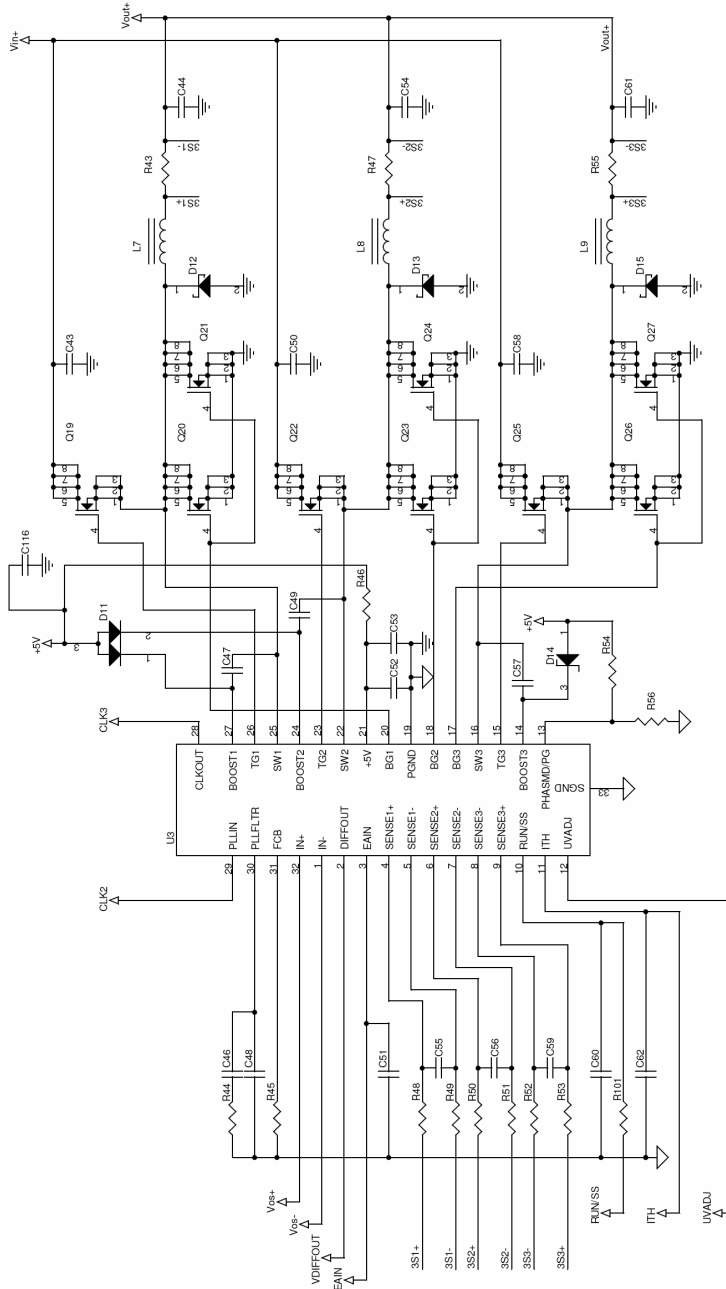
Title: 6-Phase 90A / 12-Phase 180A High Efficiency Power Supply

Document Number: DC561A-B LTC3731CUH Rev

File: Tuesday, August 05, 2003 Sheet 2 of 5

# QUICK START GUIDE FOR DEMONSTRATION CIRCUIT 561A

## 6-PHASE 90A / 12-PHASE 180A HIGH EFFICIENCY POWER SUPPLY

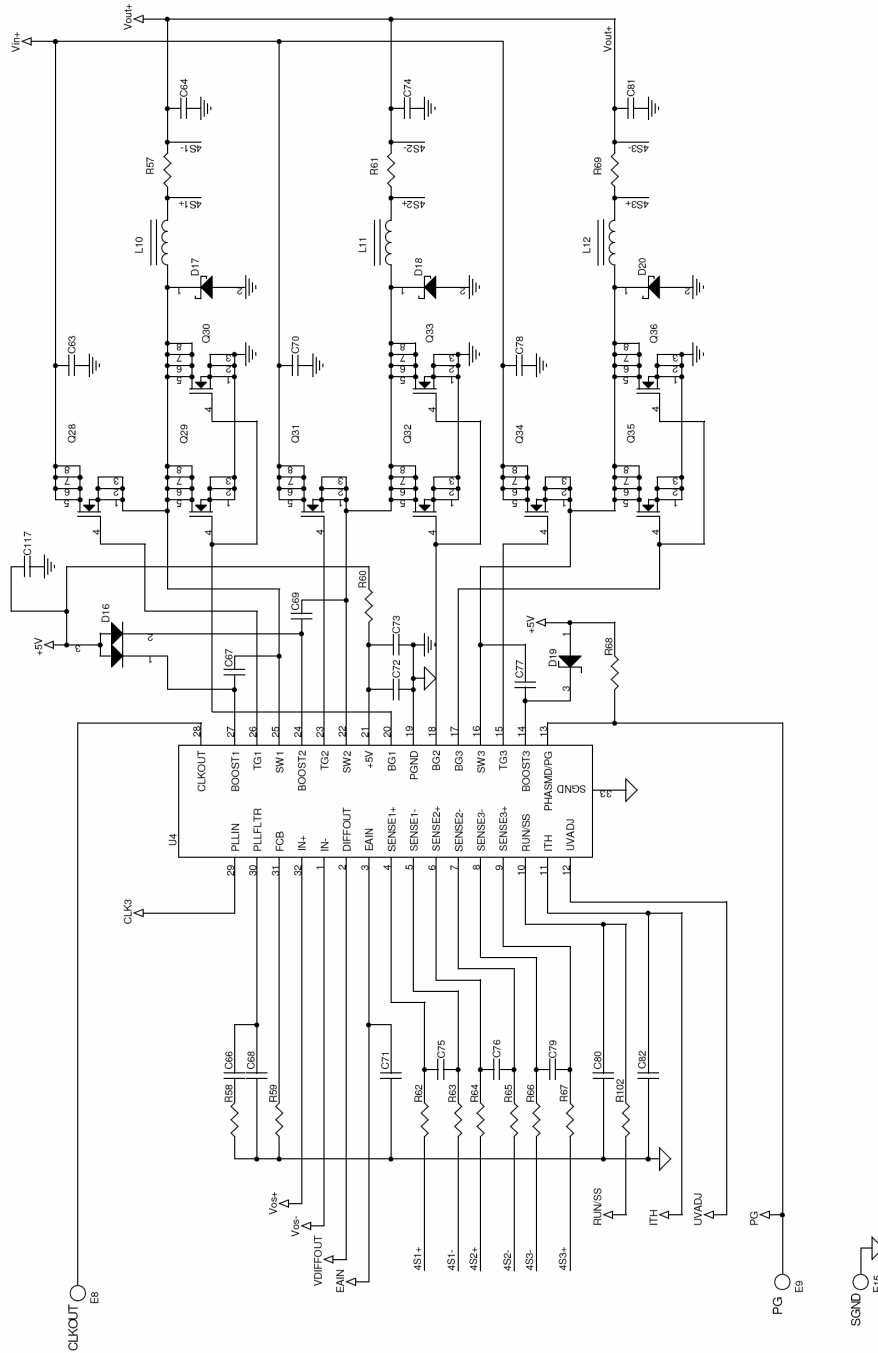


**This Page Is Not Used For 6-Phase**

LINEAR TECHNOLOGY CORPORATION	
1630 McCarthy Blvd.	
Milpitas, CA 95035	
Tel: (408) 299-2000 Fax: (408) 424-0907	
Title: 6-Phase 90A / 12-Phase 180A High Efficiency Power Supply	
Size	Document Number
	DC561A-B LTC3731CUH Rev
File: Tjuesday_August16_2003	Sheet 3 of 5

# QUICK START GUIDE FOR DEMONSTRATION CIRCUIT 561A

## 6-PHASE 90A / 12-PHASE 180A HIGH EFFICIENCY POWER SUPPLY



This Page Is Not Used For 6-Phase

LINEAR TECHNOLOGY CORPORATION

1630 McCarthy Blvd.  
Folsom, CA 95605

Phone: (916) 952-2600 Fax: (916) 434-6507

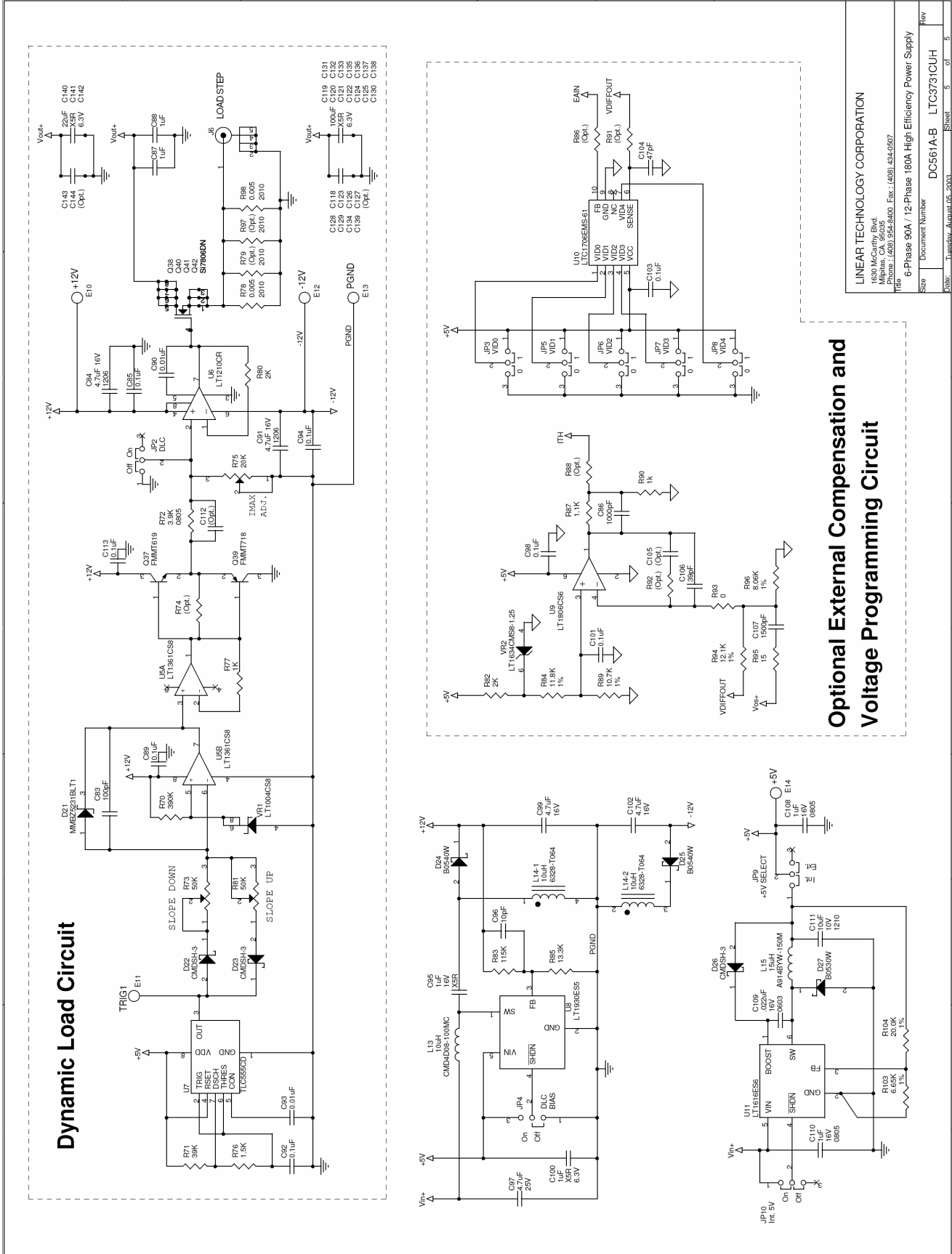
Title: 6-Phase 90A / 12-Phase 180A High Efficiency Power Supply

Size: Document Number DC561A-B LTC5731CUH

Sheet 4 of 5

# QUICK START GUIDE FOR DEMONSTRATION CIRCUIT 561A

## 6-PHASE 90A / 12-PHASE 180A HIGH EFFICIENCY POWER SUPPLY



LINEAR TECHNOLOGY CORPORATION  
 1630 McCarthy Blvd.  
 Milpitas, CA 95035  
 Tel: (408) 252-2600 Fax: (408) 454-6577

Size Document Number DC561A-B LTC3731CUH Rev  
 Date Tuesday, August 05, 2003 Sheet 5 of 5

### Optional External Compensation and Voltage Programming Circuit

Компания «Океан Электроники» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Поставка оригинальных импортных электронных компонентов напрямую с производств Америки, Европы и Азии, а так же с крупнейших складов мира;
- Широкая линейка поставок активных и пассивных импортных электронных компонентов (более 30 млн. наименований);
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Компания «Океан Электроники» является официальным дистрибьютором и эксклюзивным представителем в России одного из крупнейших производителей разъемов военного и аэрокосмического назначения «JONHON», а так же официальным дистрибьютором и эксклюзивным представителем в России производителя высокотехнологичных и надежных решений для передачи СВЧ сигналов «FORSTAR».



## JONHON

«JONHON» (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели,  
кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).



Телефон: 8 (812) 309-75-97 (многоканальный)

Факс: 8 (812) 320-03-32

Электронная почта: [ocean@oceanchips.ru](mailto:ocean@oceanchips.ru)

Web: <http://oceanchips.ru/>

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А