DESCRIPTION

Demonstration circuit 908A is a Polyphase 3-Output Step-Down Supply with Tracking featuring the LTC3773EG. The output voltages are 3.3V, 2.5V and 1.8V and the maximum load current for each is 15A. The input voltage range is 7V to 24V. Typical applications include servers, communications, computers and industrial power supplies.

The board can be programmed for either continuous-conduction mode (CCM), pulse skip mode (DCM) or Burst Mode (BM). Other features of the board include an SDB pin which can be used for rail sequencing, a phase mode pin, and a dynamic load circuit for each rail.

An on-board LT1933 (5V / 500mA buck converter) provides current for the LTC3773EG's internal logic and gate drive circuitry. The 5V bias can also be supplied externally. If an external bias voltage is applied it needs to be between 4.5V and 7.0V.

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

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

PARAMETER	CONDITION	VALUE
Minimum Input Voltage		7V
Maximum Input Voltage		24V
V_{OUT1}	V_{IN} = 7V to 24V, I_{OUT} = 0A to 15A	3.3V ±3%
V_{OUT2}	V_{IN} = 7V to 24V, I_{OUT} = 0A to 15A	2.5V ±3%
V_{OUT3}	V_{IN} = 7V to 24V, I_{OUT} = 0A to 15A	1.8V ±3%
Typical output voltage ripple for VOUT1	VIN = 12V, IOUT1 = 15A, 20MHz BW	25mVp-p TYP
Typical output voltage ripple for VOUT2	VIN = 12V, IOUT2 = 15A, 20MHz BW	25mVp-p TYP
Typical output voltage ripple for VOUT3	VIN = 12V, IOUT3 = 15A, 20MHz BW	25mVp-p TYP
Nominal Switching Frequency		220kHz TYP
Efficiency (see Figure 4 for typical efficiency curves)	V_{IN} = 12V, V_{OUT1} = 3.3V, I_{OUT1} = 15A V_{IN} = 12V, V_{OUT2} = 2.5V, I_{OUT2} = 15A V_{IN} = 12V, V_{OUT3} = 1.8V, I_{OUT3} = 15A	92.2% TYP 90.9% TYP 88.9% TYP

QUICK START PROCEDURE

Demonstration circuit 908A is easy to set up to evaluate the performance of the LTC3773EG. 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 directly across the Vout and GND terminals. See Figure 2 for proper scope probe technique.

1. Place the jumpers as shown below:

Description	JP#	Position
INT5V	JP5	ON
5V SELECT	JP3	INT5V
SDB	JP1	ON
SYNC	JP2	CCM
PHMD	JP6	LOW

2. With power off, connect the input power supply to Vin and GND.
3. Turn on the input voltage and set it to a voltage between 7V and 24V. The input voltage source should be able to supply at least 20A.

   NOTE: Make sure the input voltage does not exceed 24V.
4. Check for the proper output voltages:
   Vout1 = 3.201V to 3.399V
   Vout2 = 2.425V to 2.575V
   Vout3 = 1.746V to 1.854V
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.

LOAD STEP RESPONSE

The load step response for each rail can be tested with an on-board dynamic load circuit and a pulse generator. Refer to Figure 3 and follow the steps below.

1. Set the output of the pulse generator for a duty cycle of less than 5% and an amplitude of 1V or below.
2. Connect the output of pulse generator from Pulse Gen+ to Pulse Gen-.
3. Connect the LOAD STEP BNC connector to an oscilloscope with a coaxial cable to monitor the load step current waveform. 10mV = 1A.
4. Turn-on the 908A and apply the desired amount of static load to the output.
5. Increase the amplitude of the pulse generator output to obtain the desired load step height.
6. Monitor the output voltage across the turrets as shown.

RAIL TRACKING AND SEQUENCING

The DC908A is setup for coincident rail tracking, where both Vout2 and Vout3 track Vout1 directly through their TRACK pins and TRACK dividers. Refer to Figure 5 for the turn-on waveforms. The ramp-rate for Vout1 is determined by a 10nF capacitor on the TRACK1 pin at C8 on the demo board. If desired, Vout1 can be setup to track an external signal. To do this, remove C8 and stuff the appropriate values for the TRACK 1 divider at R40 and R41 and apply the tracking signal to the TRACK1 turret.

If desired, the rails can be configured to be turned on and off independently. To do this, remove the TRACK2 and TRACK3 dividers at R33, R35, R38 and R39, and stuff TRACK capacitors at C31 and C32 to set the desired ramp-rate. Rail sequencing can be implemented by placing a capacitor on the SDB pin. As the voltage on the SDB pin ramps-up, Vout1 will turn on 1st, Vout2 will turn on 2nd and Vout3 will turn-on last. Refer to the data sheet for more details on rail tracking and sequencing.

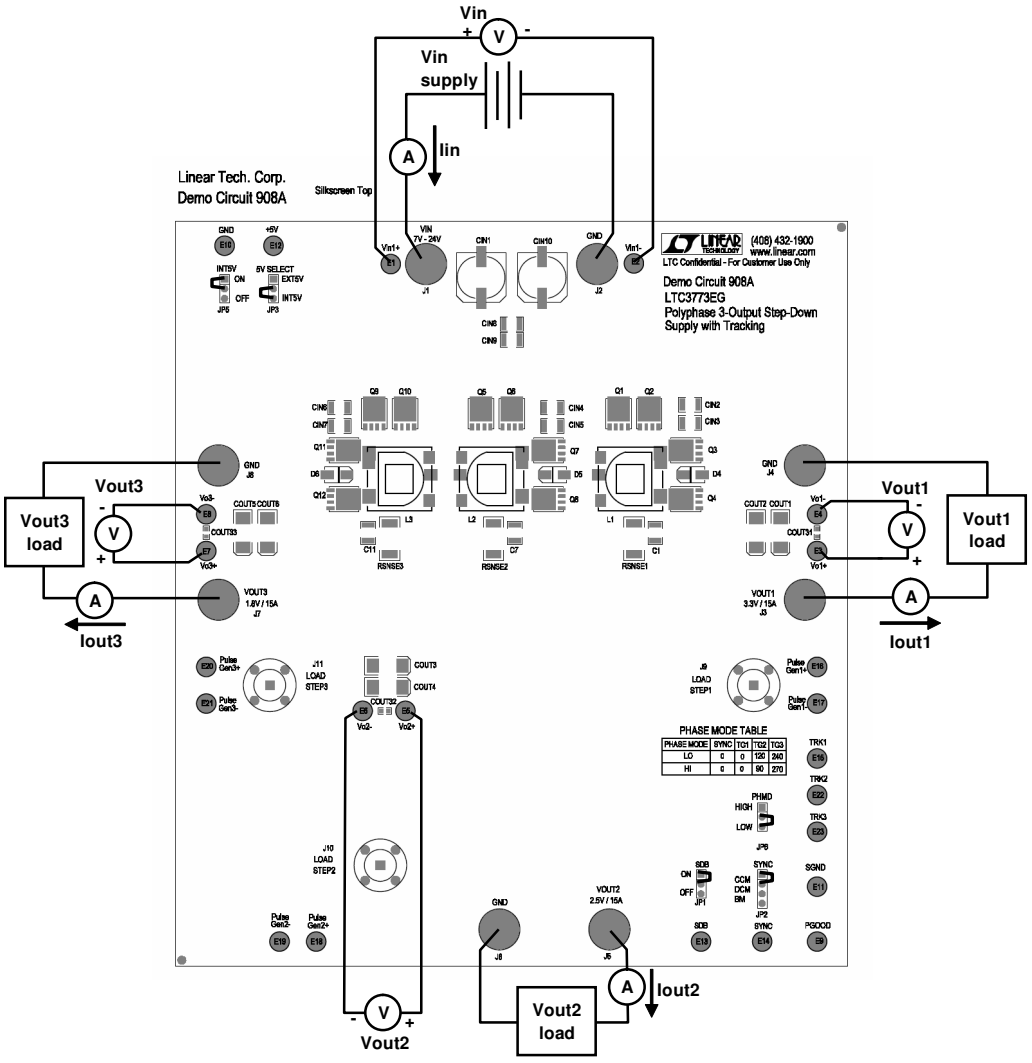


Figure 1. Proper Measurement Equipment Setup

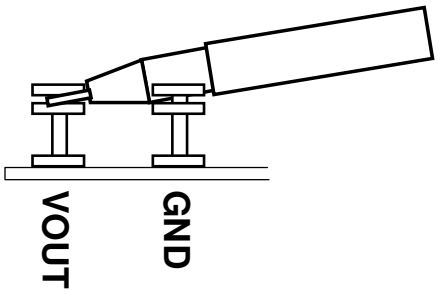


Figure 2. Measuring Output Voltage Ripple

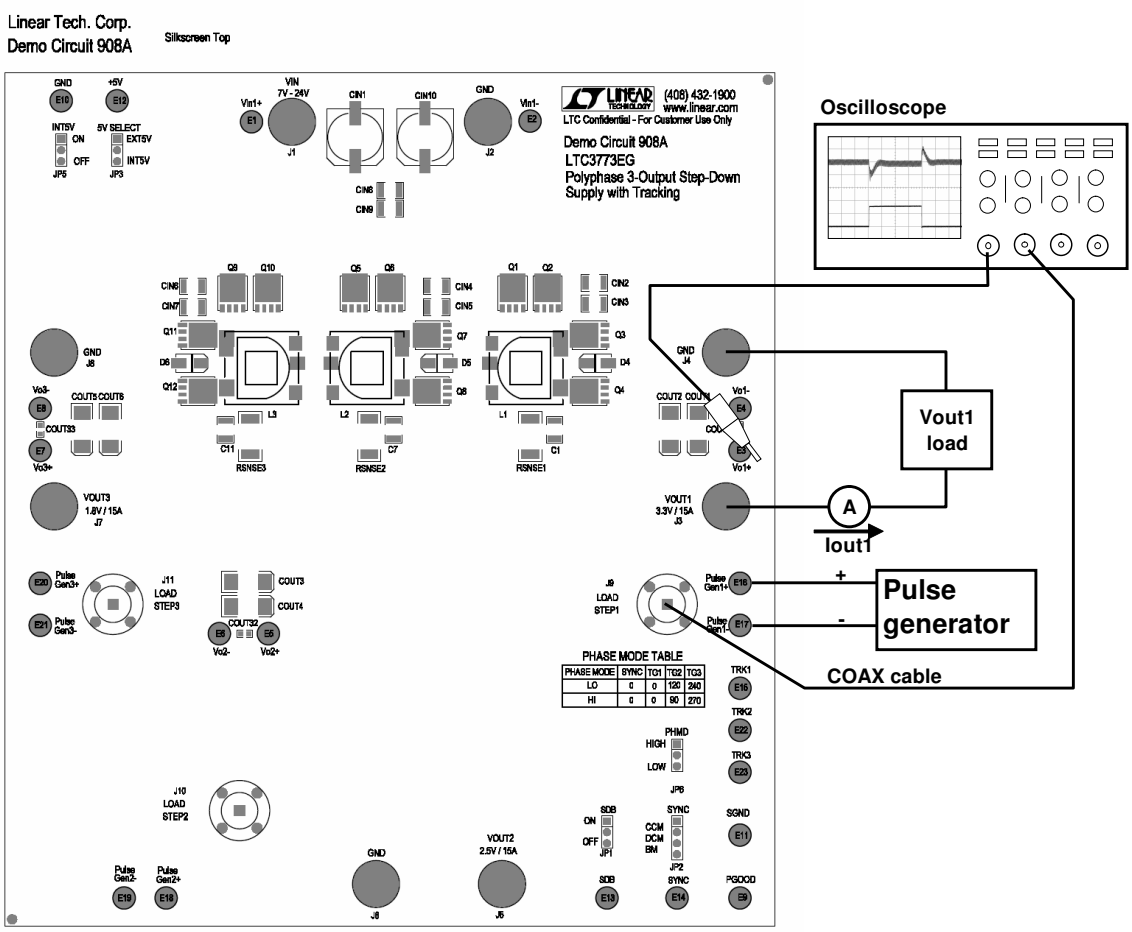
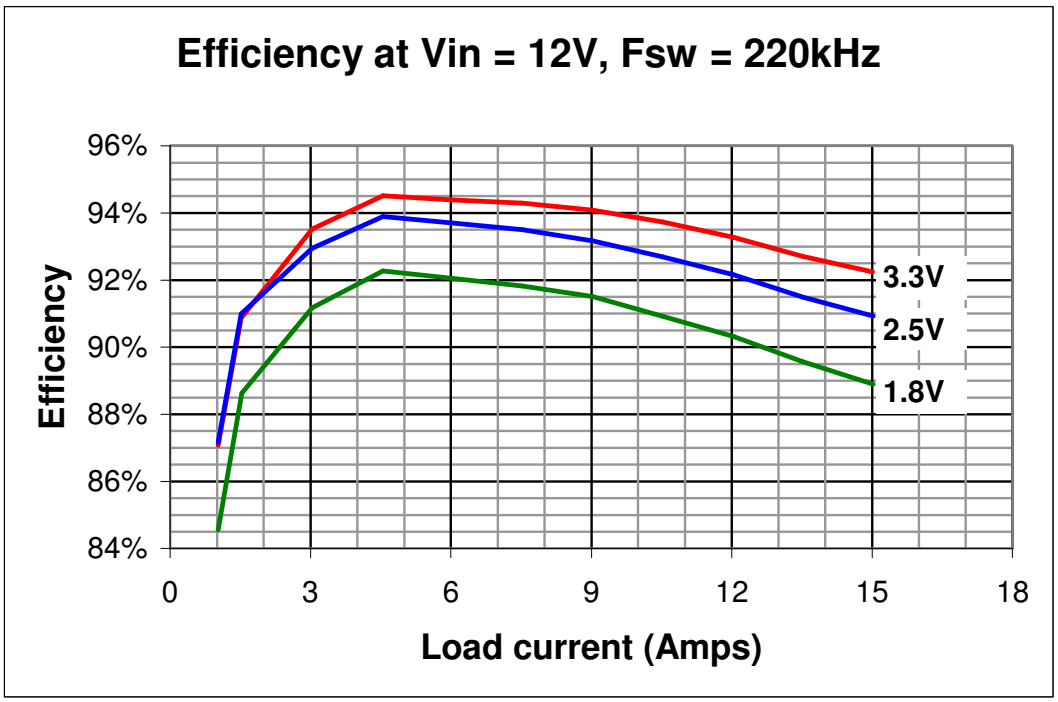


Figure 3. Proper Measurement Equipment Setup for Load Step Testing. Only the setup for the 3.3V rail is shown.



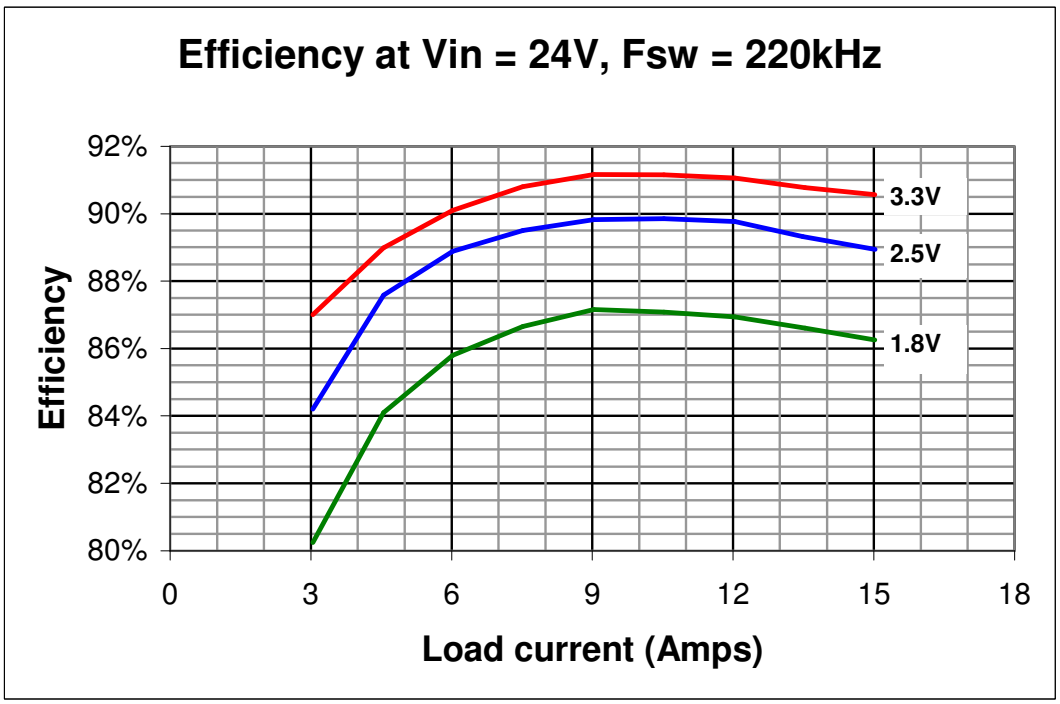


Figure 4. Typical efficiency curves

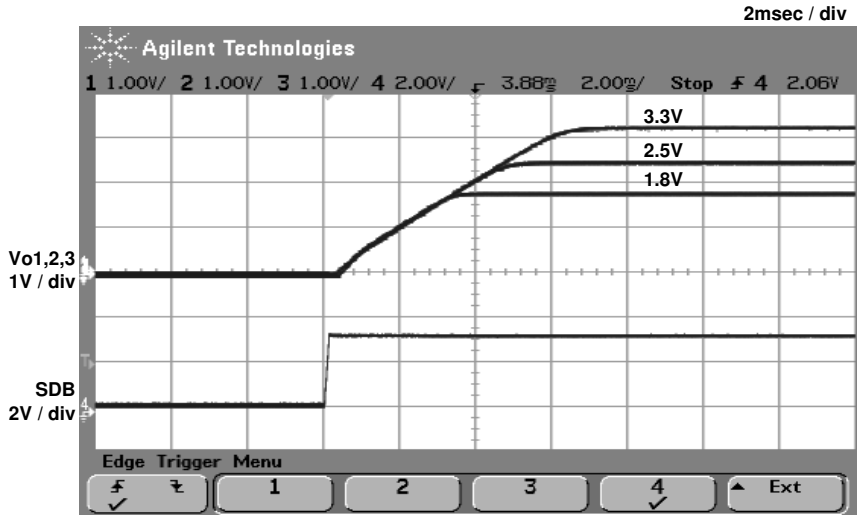
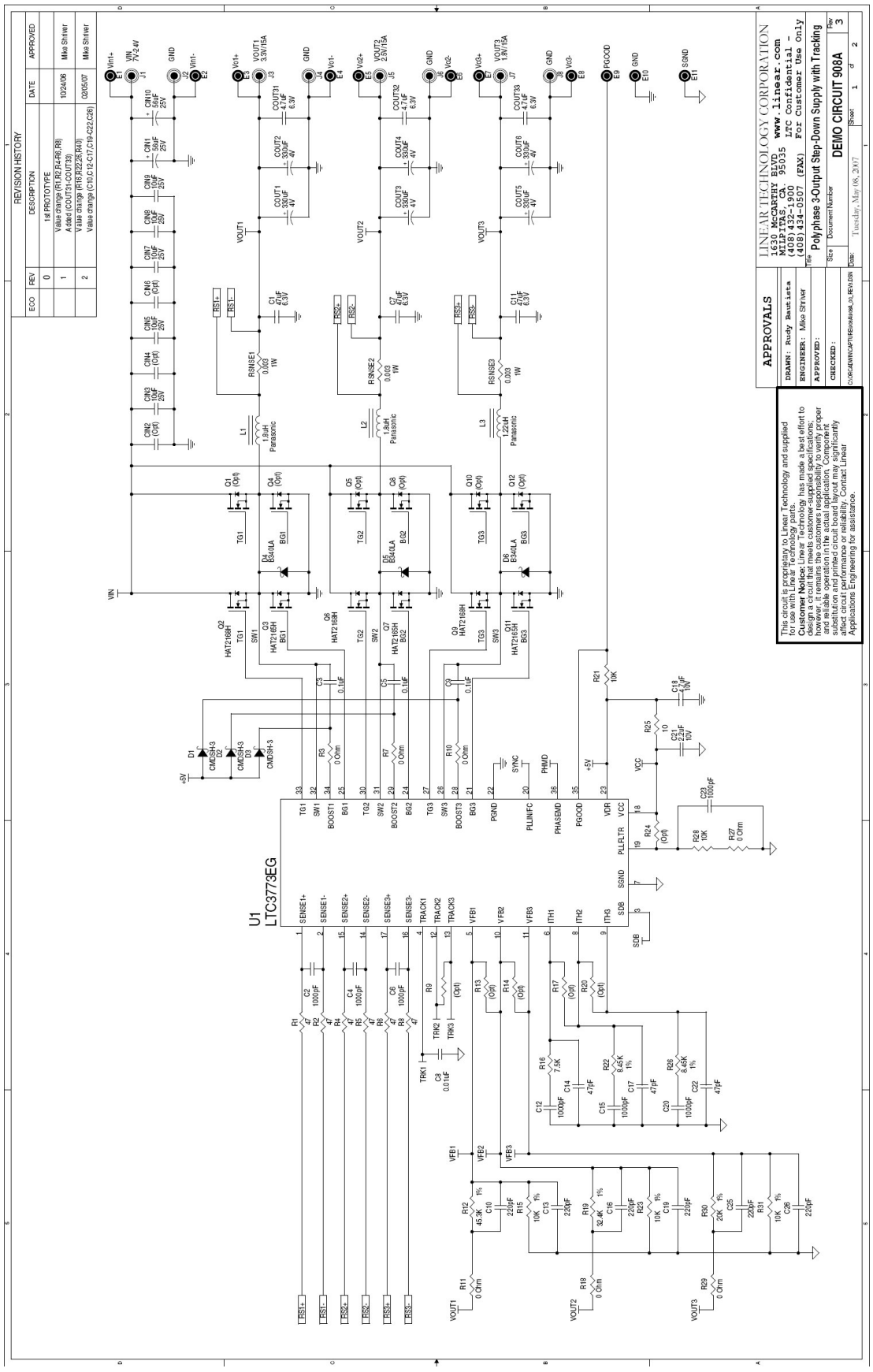


Figure 5. Turn-on waveforms at Vin = 12V after SDB pin is released. Demo board is setup for coincident rail tracking.


REVISION HISTORY
ECO REV DESCRIPTION DATE APPROVED
0 1st PROTOTYPE 10/24/06 Mike Shriver
1 Value change (R1,R2,R4-R6,R8) Added (COUT31-COUT39) 10/24/06 Mike Shriver
2 Value change (R16,R22,26,R40) Value change (C10,C12-C17,C19-C22,C26) 02/05/07 Mike Shriver
APPROVALS
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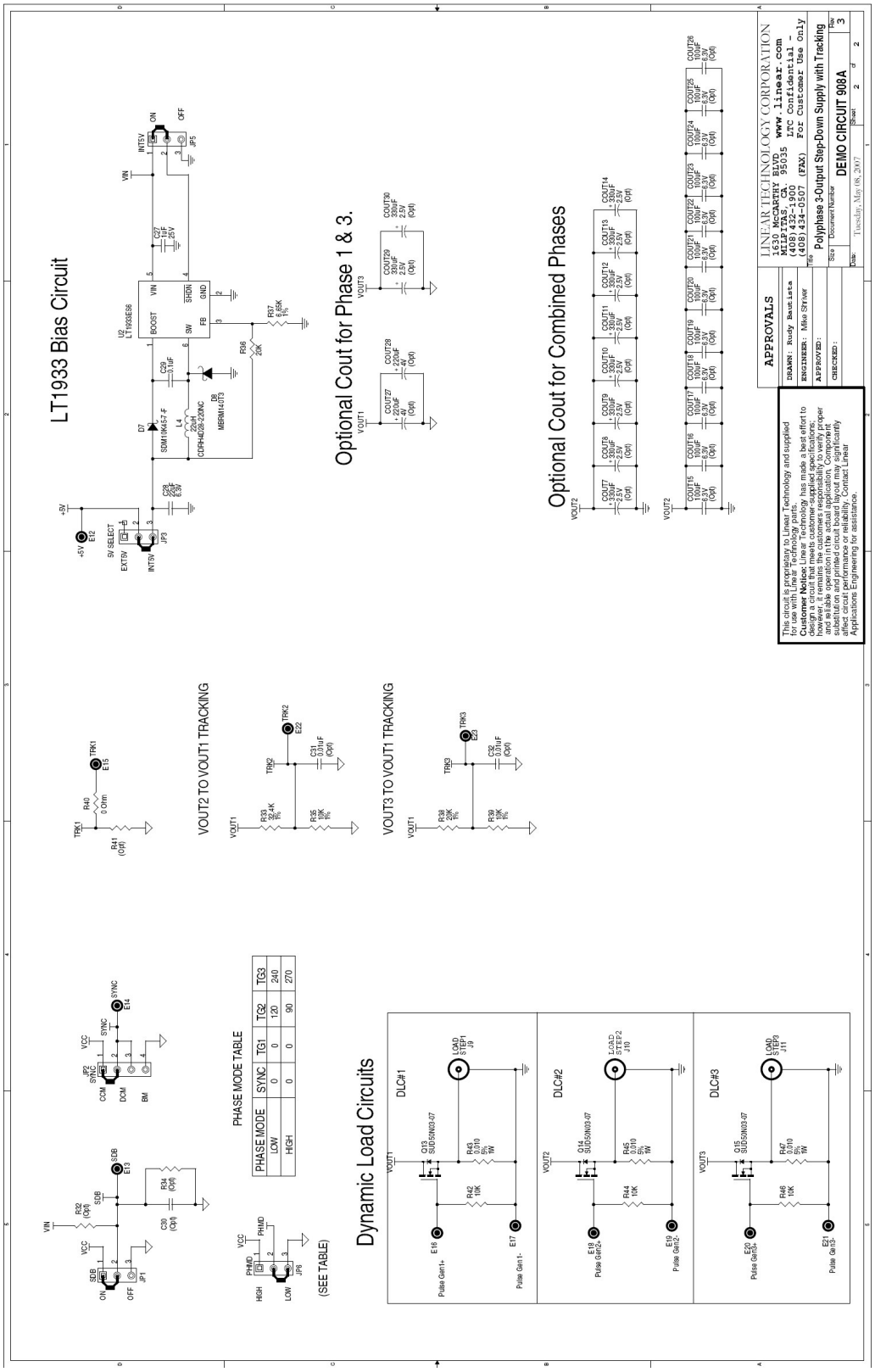
LTC Confidential - For Customer Use Only
Polyphase 3-Output Step-Down Supply with Tracking
DEMO CIRCUIT 908A
Tuesday, May 08, 2007
U1
LTC3773EG
VIN 7V-24V
VOUT1 3.3V/15A
VOUT2 2.5V/15A
VOUT3 1.8V/15A
PGOOD
SGND


LT1933 Bias Circuit
Optional Cout for Phase 1 & 3.
Optional Cout for Combined Phases
VOUT2 TO VOUT1 TRACKING
VOUT3 TO VOUT1 TRACKING
Dynamic Load Circuits
PHASE MODE TABLE
PHASE MODE | SYNC | TG1 | TG2 | TG3
LOW | 0 | 0 | 120 | 240
HIGH | 0 | 0 | 90 | 270
(SEE TABLE)
DLC#1
DLC#2
DLC#3
APPROVALS
LINEAR TECHNOLOGY CORPORATION
Polyphase 3-Output Step-Down Supply with Tracking
DEMO CIRCUIT 908A
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