DESCRIPTION

Demonstration circuit 913 is a high efficiency and high density supply featuring the 3-output, 3-phase synchronous buck regulator LTC3773. The input voltage range of the demo board is designed for 4.5V to 13.5V, though the LTC3773 controller can take up to 36V_{MAX} Vin. The outputs of this board are 2.5V/15A,1.8V/15A and 1.2V/15A. To minimize input ripple current and capacitor size, there is 120° phase clock interleaving among every two phases. The power up/down tracking of the three output voltages is programmable. The supply can be synchronized to an external clock signal.

The critical power components are on the top side of the PC board and are within a 1.7" x 1.7" "drop-in" layout area. The small signal components and IC are on the bottom side of the PC board within a 1" x 1" board area. The LTC3773EUHF regulator IC is in a small 5mm x 7mm QFN package with exposed thermal pad for low thermal impedance. An optional 5V bias supply is stuffed on the board to power the LTC3773.

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	Typical	4.5V-13.5V (15V abs_max)
Output Voltage V_{OUT1}	I_{OUT1} = 0A to 15A	2.5V ± 2%
Output Voltage V_{OUT2}	I_{OUT2} = 0A to 15A	1.8V ± 2%
Output Voltage V_{OUT3}	I_{OUT3} = 0A to 15A	1.2V ± 2%
Maximum Output Current	VIN = 4.5V-13.5V	15A Each Output
Switching frequency	4.5V-13.5Vin	400kHz
Full Load Efficiency	V_{IN} = 12V, V_{OUT1} = 2.5V, I_{OUT1} = 15A	90% Typical
	V_{IN} = 12V, V_{OUT2} = 1.8V, I_{OUT2} = 15A	88 % Typical
	V_{IN} = 12V, V_{OUT3} = 1.2V, I_{OUT3} = 15A	84.5 % Typical

QUICK START PROCEDURE

Demonstration circuit 913 is easy to set up to evaluate the performance of the LTC3773EUHF. 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. The following are the default jumper settings:

+5V Select	INT 5V	PHASMD	SDB1	SDB2	SDB3	FC
INT.	ON	120	ON	ON	ON	CCM

The following tables show the assembly options to program the power up/down tracking among Vout1, Vout2 and Vout3:

	VOUT1 TRACKING OPTIONS	R8	C13	C10
1*	Softstart W/O tracking	0	DNP	0.01uF
2	Track TRACK1	Stuff, value TBD	Stuff R, value TBD	DNP

	VOUT2 TRACKING OPTIONS	R13	R18	C22
1	Softstart W/O tracking	DNP	DNP	0.01uF
2*	Track VOUT1	20K	10K	DNP

	VOUT3 TRACKING OPTIONS	R28	R30	C29
1	Softstart W/O tracking	DNP	DNP	0.01uF
2*	Track VOUT2	10K	10K	DNP

*With existing tracking circuit assembly, VOUT1 starts independently (Option 1). VOUT2 tracks VOUT1 during start up (option 2). VOUT3 tracks VOUT2 during start up (option 2). Figure 6 and 7 are the typical power-up/down waveforms with rail tracking.

2. With power off, connect the input power supply to VIN and GND. Connect the loads between VOUT1, VOUT2, VOUT3 and GND. Preset the load current at 0A (minimum). Refer to Figure 1 for correct test set up.

3. Turn on the input power.

NOTE: Make sure that the input voltage does not exceed 15V.

4. Check for the proper output voltages: V_{OUT1}: 2.45V-2.55V, V_{OUT2}: 1.764V – 1.836V, and V_{OUT3}: 1.176V – 1.224V

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

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.

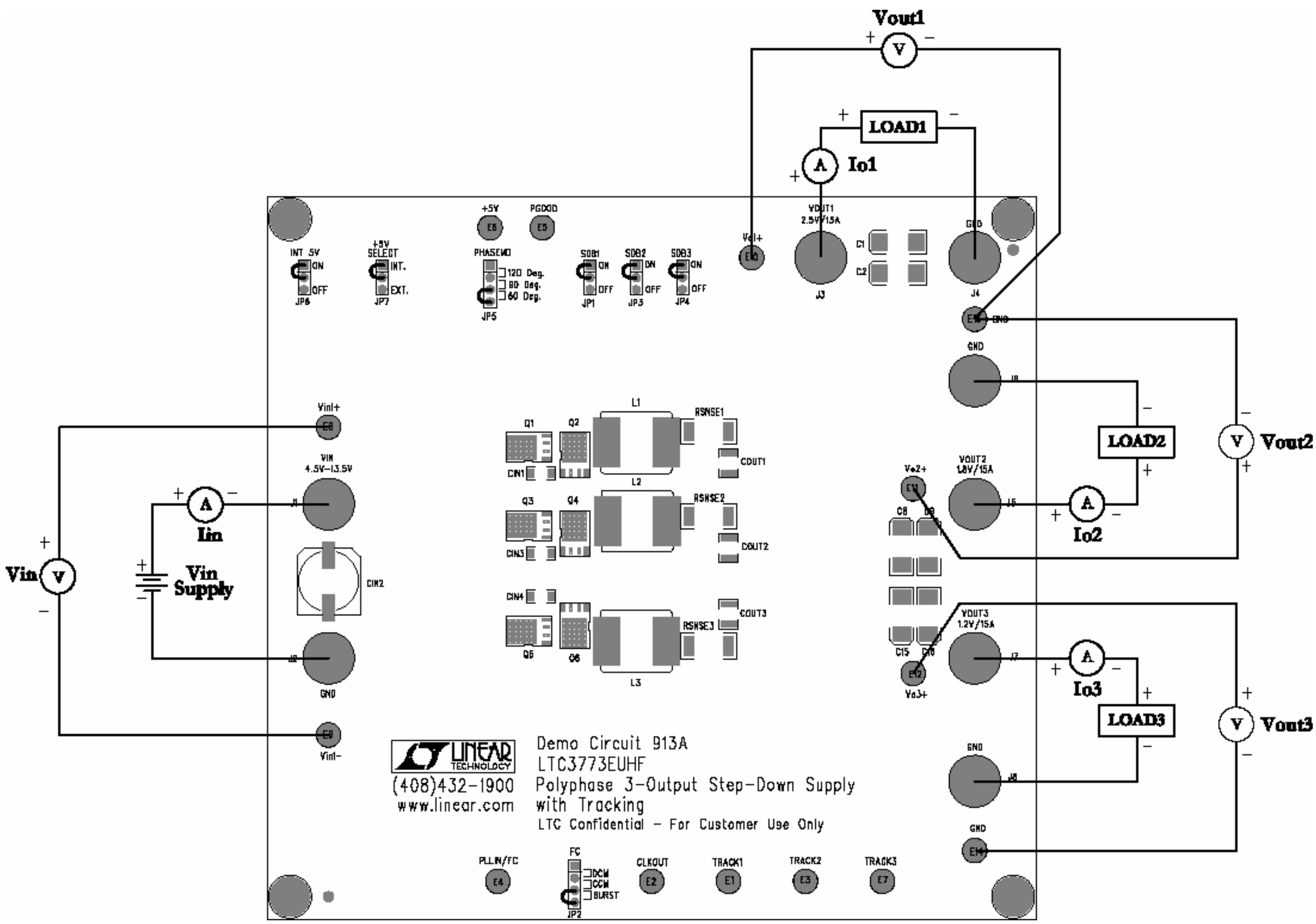


Figure 1. Proper Measurement Equipment Setup

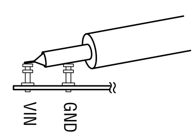


Figure 2. Measuring Input or Output Ripple

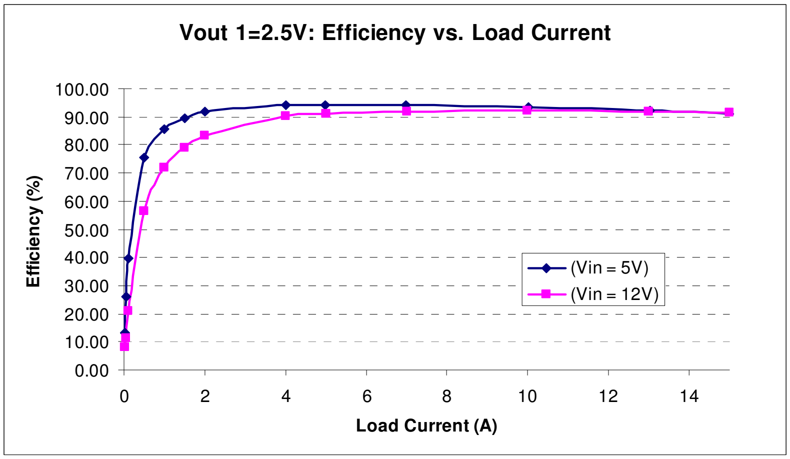


Figure 3. Typical Supply Efficiency vs Load Current of 2.5V output

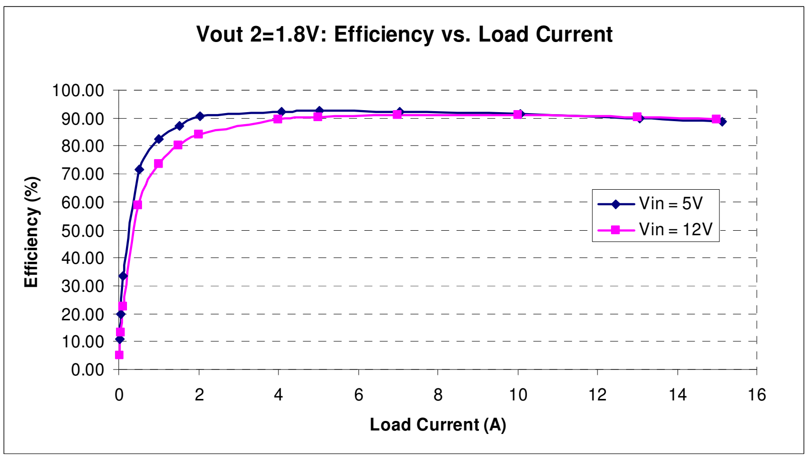


Figure 4. Typical Supply Efficiency vs Load Current of 1.8V output

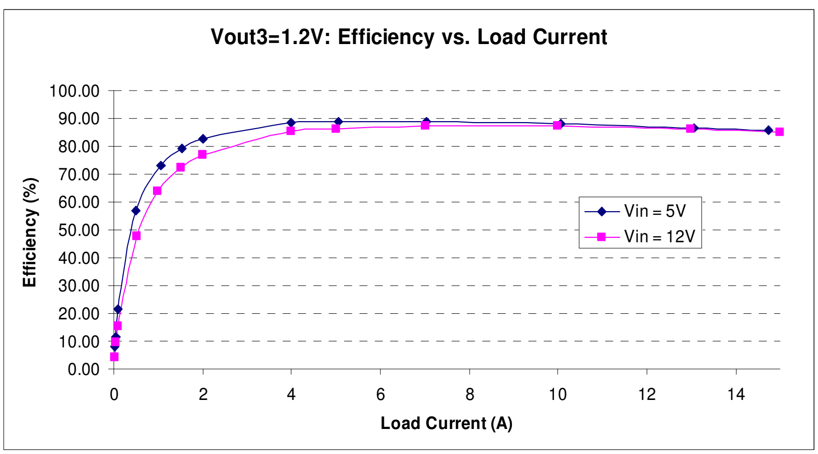


Figure 5. Typical Supply Efficiency vs Load Current of 1.2V output

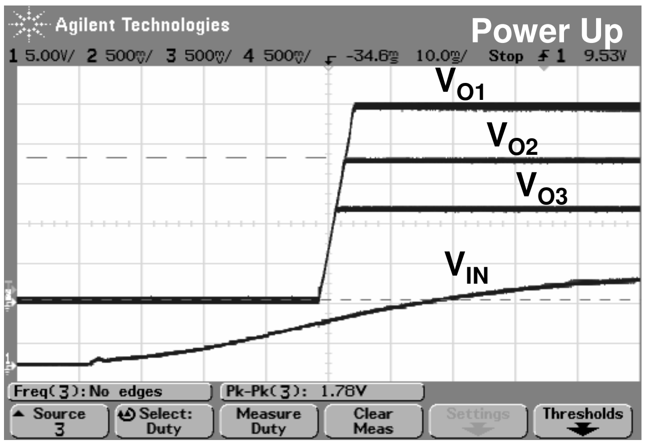


Figure 6. Power Up Tracking

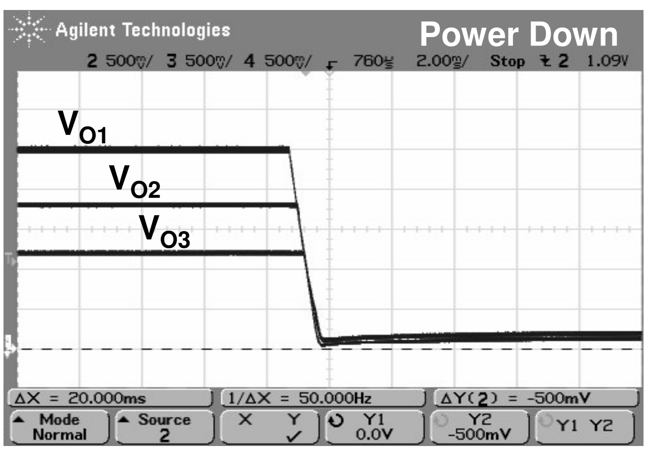
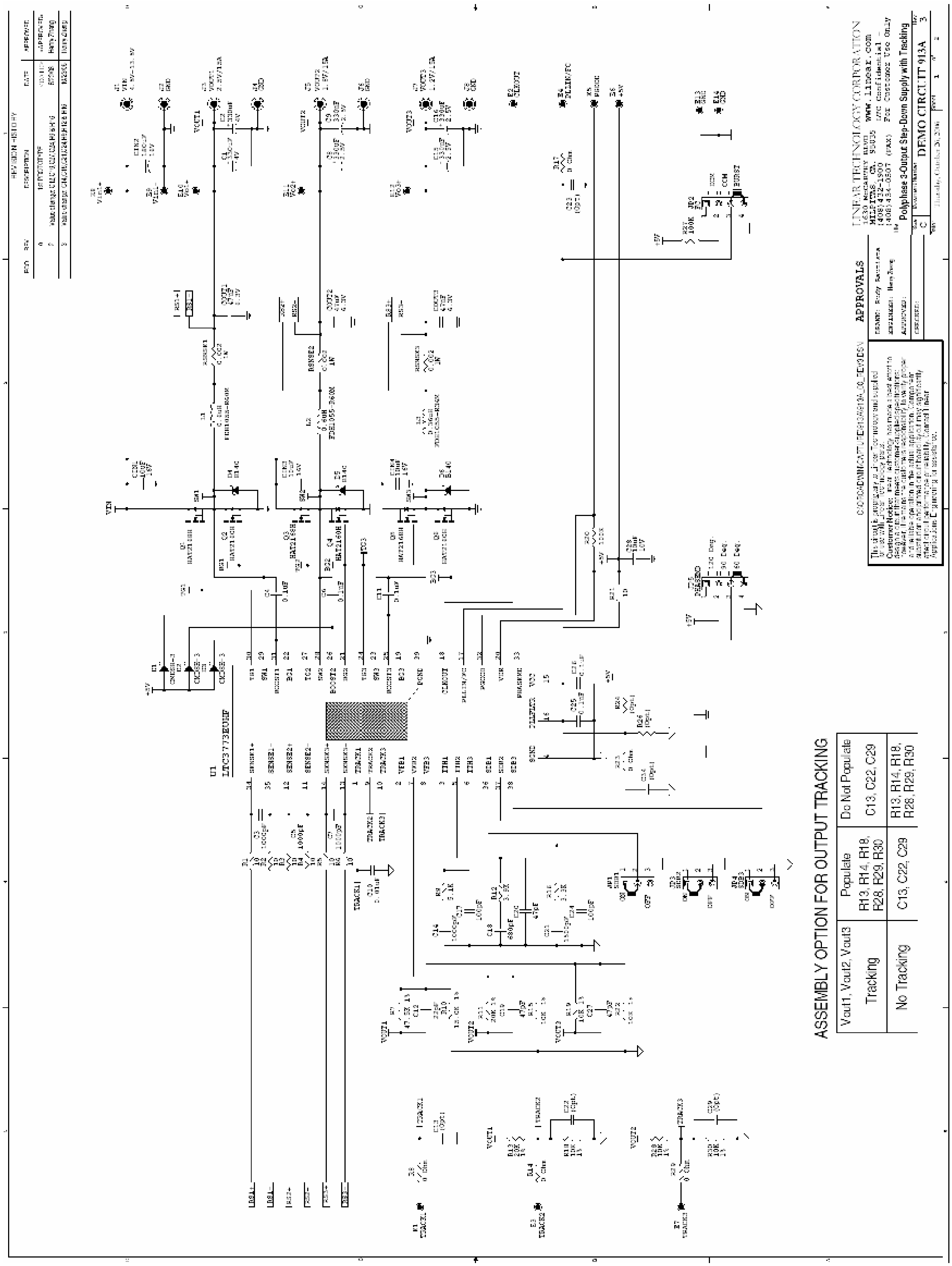
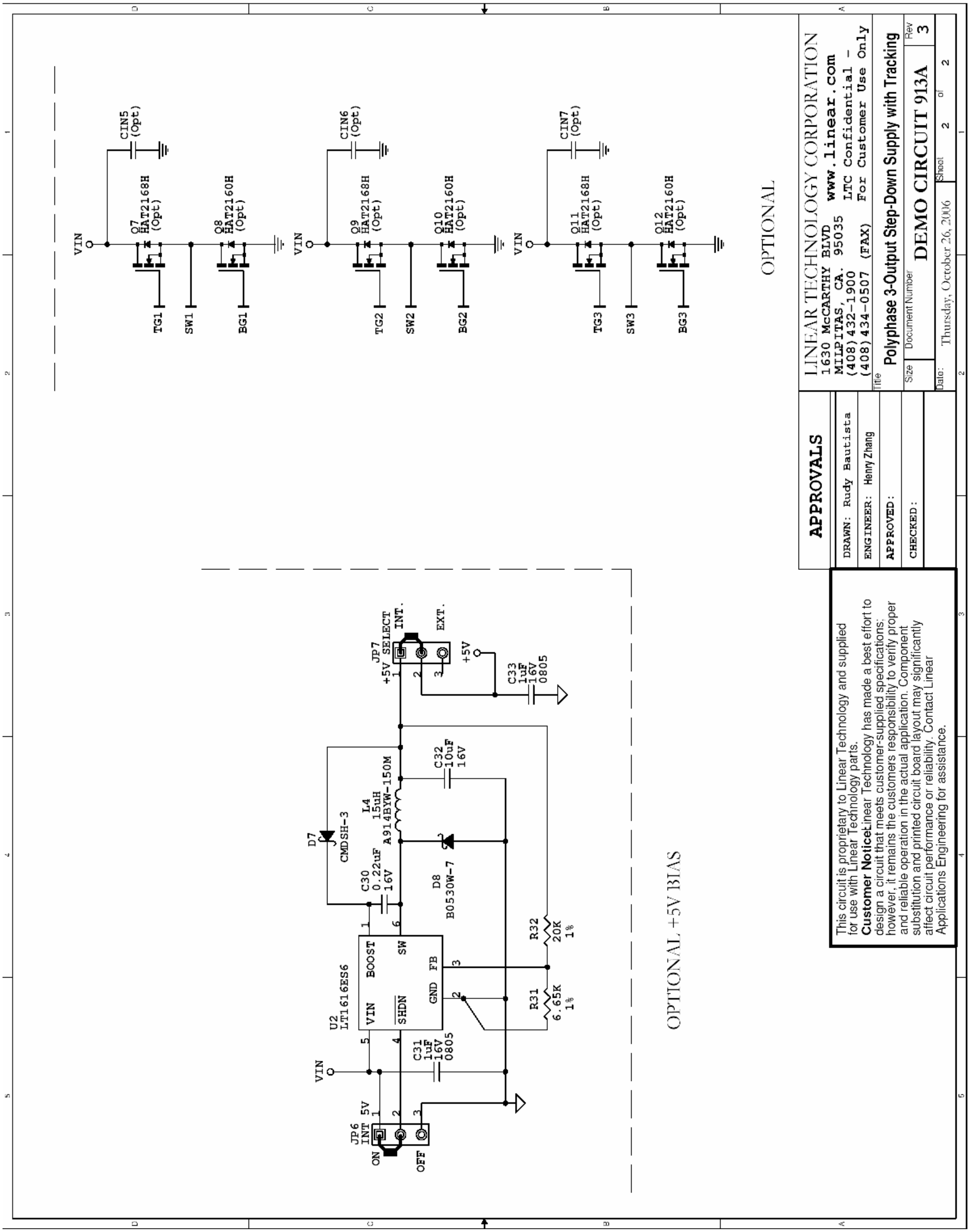


Figure 7. Power Down Tracking


ASSEMBLY OPTION FOR OUTPUT TRACKING
Vout1, Vout2, Vout3
Populate
Do Not Populate
Tracking
R13, R14, R19, R28, R29, R30
C13, C22, C29
No Tracking
C13, C22, C29
R13, R14, R18, R28, R29, R30
LTC3773EUHF
APPROVALS
LINEAR TECHNOLOGY CORPORATION
Polyphase 3-Output Step-Down Supply with Tracking
DEMO CIRCUIT 913A


VIN
Q7 HAT2168H (Opt)
Q8 HAT2160H (Opt)
CIN5 (Opt)
TG1
SW1
BG1
Q9 HAT2168H (Opt)
Q10 HAT2160H (Opt)
CIN6 (Opt)
TG2
SW2
BG2
Q11 HAT2168H (Opt)
Q12 HAT2160H (Opt)
CIN7 (Opt)
TG3
SW3
BG3
OPTIONAL
U2 LT1616ES6
VIN
SHDN
GND
FB
BOOST
SW
C30 0.22uF 16V
D7 CMDSH-3
L4 15uH A914BYW-150M
D8 B0530W-7
C32 10uF 16V
R32 20K 1%
R31 6.65K 1%
C31 1uF 16V 0805
JP6 INT 5V
ON
OFF
JP7 +5V SELECT
INT.
EXT.
+5V
C33 1uF 16V 0805
OPTIONAL +5V BIAS
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DEMO CIRCUIT 913A
Rev
3
Date: Thursday, October 26, 2006
Sheet 2 of 2
This circuit is proprietary to Linear Technology and supplied for use with Linear Technology parts.
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