Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of “Quality Parts,Customers Priority,Honest Operation,and Considerate Service”,our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!

Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832
Email & Skype: info@chipsmall.com Web: www.chipsmall.com
Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China

DEMO CIRCUIT 1672A
QUICK START GUIDE

LTC3816EUHF
HIGH EFFICIENCY SINGLE PHASE BUCK CONVERTER FOR INTEL IMVP-6/IMVP-6.5 CPUs

DESCRIPTION

Demonstration circuit 1672A is a high efficiency, single phase, synchronous buck converter for Intel IMVP-6/IMVP-6.5 CPUs. It can supply 25A maximum load current at up to 1.5V output with 4.5V to 28V input range. The demo board features the LTC®3816EUHF controller. The LTC3816 is a single-phase synchronous buck controller in a constant-frequency voltage mode architecture. The controller's leading edge modulation topology allows extremely low output voltages and supports a phase-lockable switching frequency up to 550kHz. The output voltage is programmed using a 7-bit VID code. The default VID jumpers (VID6 to VID0) are set to be 0110000 for 0.9V output. The LTC3816 features all of the IMVP-6/IMVP-6.5 requirements, including start-up to a preset boot voltage, differential remote output voltage sensing with programmable active voltage positioning, Imon output current reporting, power optimization during sleep state, and slow slew rate sleep state exit. Fault protection features include input undervoltage lockout, cycle-by-cycle current limit, output overvoltage protection, and power-good (PWRGD) and overtemperature flags. The LTC3816 supports wide input range (4.5V to 36V) with optional line feedforward compensation, temperature compensated inductor DCR or sense resistor output current monitoring. The LTC3816 can provide high efficiency, high power density and versatile power solutions for embedded computing, mobile computers, internet devices and navigation displays. The controller is available in 38-pin thermally enhanced eTSSOP and 5mm × 7mm QFN packages.

The VRON pin (JP15) provides enable feature. To shut down the converter, one simple way is to force the VRON pin below 0.65V (JP15: OFF). Use JP19 jumper to select pulse-skipping or forced continuous mode operation. Switching frequency is pre-set at about 400KHz, and it can be easily modified from 150KHz to 550KHz. JP20~JP26 (VID0~VID7) are used to set the output voltage based on the IMVP-6/IMVP-6.5 VID code, as shown in table 2. JP1 and JP18 are used to select either IMVP6 or IMVP6.5 specification. For detailed information, please see LTC3816 data sheet and Intel IMVP-6/IMVP-6.5 specification.

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 28V
Output Voltage, V_{OUT}	V_{IN} = 4.5-28V, I_{OUT} = 0A to 23A, VID6-0=0110000	0.9V ±1.5%
Maximum Output Current, I_{OUT}	V_{IN} = 4.5-28V, V_{OUTMAX} = 1.5V	25A
Typical Efficiency	V_{IN} = 12V, V_{OUT} = 1.5V, I_{OUT} = 23A	86.7%
Typical Switching Frequency		400kHz

Table 2. IMVP-6/IMVP-6.5 VID Output Voltage Programming

VID6	VID5	VID4	VID3	VID2	VID1	VID0	$V_{CC(CORE)}$
0	0	0	0	0	0	0	1.5000
0	0	0	0	0	0	1	1.4875
0	0	0	0	0	1	0	1.4750
0	0	0	0	0	1	1	1.4625
0	0	0	0	1	0	0	1.4500
0	0	0	0	1	0	1	1.4375
0	0	0	0	1	1	0	1.4250
0	0	0	0	1	1	1	1.4125
0	0	0	1	0	0	0	1.4000
0	0	0	1	0	0	1	1.3875
0	0	0	1	0	1	0	1.3750
0	0	0	1	0	1	1	1.3625
0	0	0	1	1	0	0	1.3500
0	0	0	1	1	0	1	1.3375
0	0	0	1	1	1	0	1.3250
0	0	0	1	1	1	1	1.3125
0	0	1	0	0	0	0	1.3000
0	0	1	0	0	0	1	1.2875
0	0	1	0	0	1	0	1.2750
0	0	1	0	0	1	1	1.2625
0	0	1	0	1	0	0	1.2500
0	0	1	0	1	0	1	1.2375
0	0	1	0	1	1	0	1.2250
0	0	1	0	1	1	1	1.2125
0	0	1	1	0	0	0	1.2000
0	0	1	1	0	0	1	1.1875
0	0	1	1	0	1	0	1.1750
0	0	1	1	0	1	1	1.1625
0	0	1	1	1	0	0	1.1500
0	0	1	1	1	0	1	1.1375
0	0	1	1	1	1	0	1.1250
0	0	1	1	1	1	1	1.1125
0	1	0	0	0	0	0	1.1000
0	1	0	0	0	0	1	1.0875
0	1	0	0	0	1	0	1.0750
0	1	0	0	0	1	1	1.0625
0	1	0	0	1	0	0	1.0500
0	1	0	0	1	0	1	1.0375
0	1	0	0	1	1	0	1.0250
0	1	0	0	1	1	1	1.0125
0	1	0	1	0	0	0	1.0000
0	1	0	1	0	0	1	0.9875
0	1	0	1	0	1	0	0.9750
0	1	0	1	0	1	1	0.9625
0	1	0	1	1	0	0	0.9500
0	1	0	1	1	0	1	0.9375
0	1	0	1	1	1	0	0.9250
0	1	0	1	1	1	1	0.9125
0	1	1	0	0	0	0	0.9000
0	1	1	0	0	0	1	0.8875
0	1	1	0	0	1	0	0.8750
0	1	1	0	0	1	1	0.8625
0	1	1	0	1	0	0	0.8500
0	1	1	0	1	0	1	0.8375
0	1	1	0	1	1	0	0.8250
0	1	1	0	1	1	1	0.8125
0	1	1	1	0	0	0	0.8000
0	1	1	1	0	0	1	0.7875
0	1	1	1	0	1	0	0.7750
0	1	1	1	0	1	1	0.7625
0	1	1	1	1	0	0	0.7500
0	1	1	1	1	0	1	0.7375
0	1	1	1	1	1	0	0.7250
0	1	1	1	1	1	1	0.7125

VID6	VID5	VID4	VID3	VID2	VID1	VID0	$V_{CC(CORE)}$
1	0	0	0	0	0	0	0.7000
1	0	0	0	0	0	1	0.6875
1	0	0	0	0	1	0	0.6750
1	0	0	0	0	1	1	0.6625
1	0	0	0	1	0	0	0.6500
1	0	0	0	1	0	1	0.6375
1	0	0	0	1	1	0	0.6250
1	0	0	0	1	1	1	0.6125
1	0	0	1	0	0	0	0.6000
1	0	0	1	0	0	1	0.5875
1	0	0	1	0	1	0	0.5750
1	0	0	1	0	1	1	0.5625
1	0	0	1	1	0	0	0.5500
1	0	0	1	1	0	1	0.5375
1	0	0	1	1	1	0	0.5250
1	0	0	1	1	1	1	0.5125
1	0	1	0	0	0	0	0.5000
1	0	1	0	0	0	1	0.4875
1	0	1	0	0	1	0	0.4750
1	0	1	0	0	1	1	0.4625
1	0	1	0	1	0	0	0.4500
1	0	1	0	1	0	1	0.4375
1	0	1	0	1	1	0	0.4250
1	0	1	0	1	1	1	0.4125
1	0	1	1	0	0	0	0.4000
1	0	1	1	0	0	1	0.3875
1	0	1	1	0	1	0	0.3750
1	0	1	1	0	1	1	0.3625
1	0	1	1	1	0	0	0.3500
1	0	1	1	1	0	1	0.3375
1	0	1	1	1	1	0	0.3250
1	0	1	1	1	1	1	0.3125
1	1	0	0	0	0	0	0.3000
1	1	0	0	0	0	1	0.2875
1	1	0	0	0	1	0	0.2750
1	1	0	0	0	1	1	0.2625
1	1	0	0	1	0	0	0.2500
1	1	0	0	1	0	1	0.2375
1	1	0	0	1	1	0	0.2250
1	1	0	0	1	1	1	0.2125
1	1	0	1	0	0	0	0.2000
1	1	0	1	0	0	1	0.1875
1	1	0	1	0	1	0	0.1750
1	1	0	1	0	1	1	0.1625
1	1	0	1	1	0	0	0.1500
1	1	0	1	1	0	1	0.1375
1	1	0	1	1	1	0	0.1250
1	1	0	1	1	1	1	0.1125
1	1	1	0	0	0	0	0.1000
1	1	1	0	0	0	1	0.0875
1	1	1	0	0	1	0	0.0750
1	1	1	0	0	1	1	0.0625
1	1	1	0	1	0	0	0.0500
1	1	1	0	1	0	1	0.0375
1	1	1	0	1	1	0	0.0250
1	1	1	0	1	1	1	0.0125
1	1	1	1	0	0	0	0.0000
1	1	1	1	0	0	1	0.0000
1	1	1	1	0	1	0	0.0000
1	1	1	1	0	1	1	0.0000
1	1	1	1	1	0	0	0.0000
1	1	1	1	1	0	1	0.0000
1	1	1	1	1	1	0	0.0000
1	1	1	1	1	1	1	0.0000

QUICK START PROCEDURE

Demonstration circuit 1672A is easy to set up to evaluate the performance of the LTC3816EUHF. Refer to Figure 1 for the proper measurement equipment setup and jumpers' location, and follow the procedure below:

1. With power off, connect the input power supply to Vin (4.5V-28V) and GND (input return).
2. Set VID jumpers VID6-0: 0110000 for 0.9V ouput.
3. Connect the output load between Vout and GND (Initial load: no load).
4. Connect the DVMs to the input and outputs.
5. Turn on the input power supply and check for the proper output voltages. Vout should be within 0.885 V to 0.915V.
6. 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.

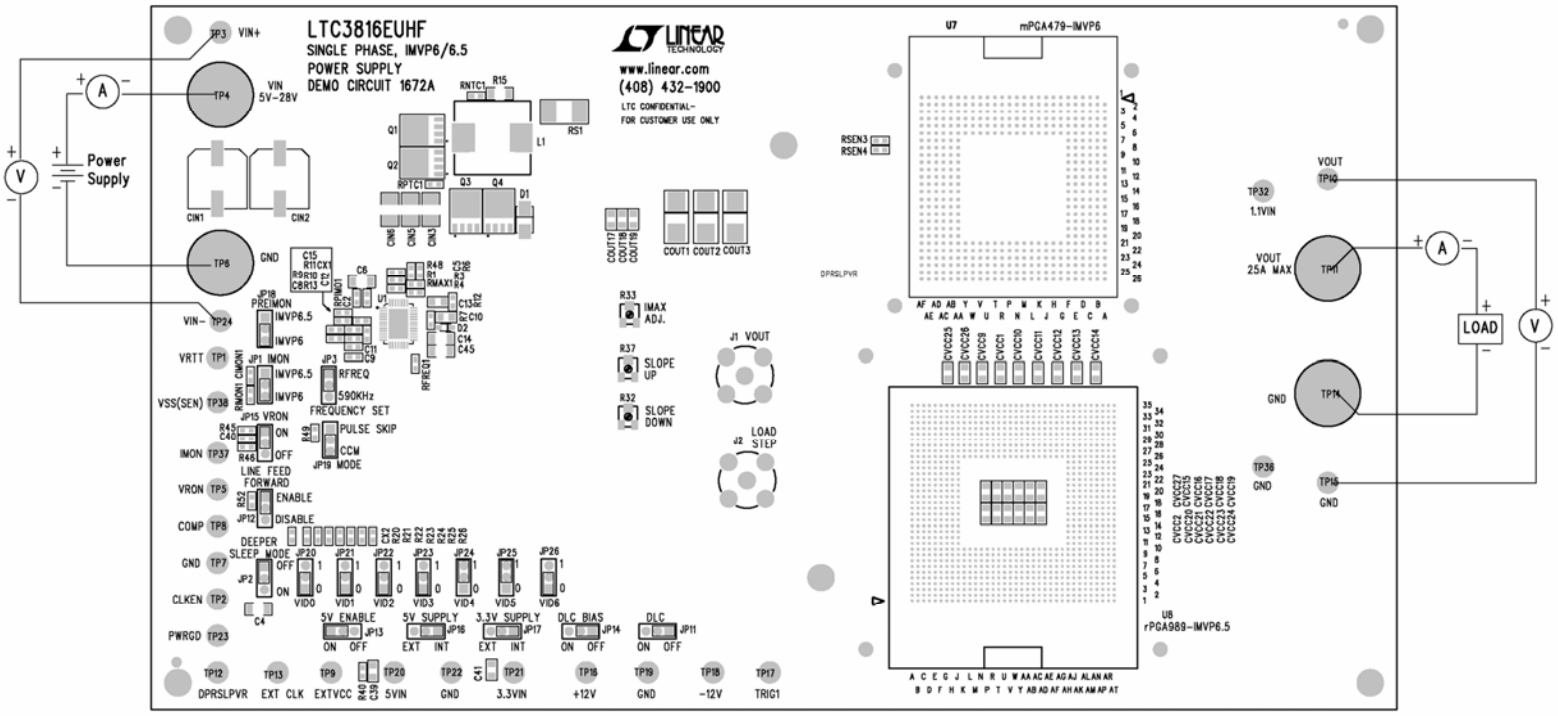


Figure 1. Proper Measurement Equipment Setup

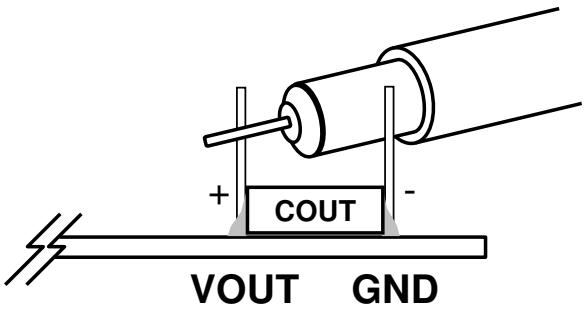


Figure 2. Measuring Output Voltage Ripple

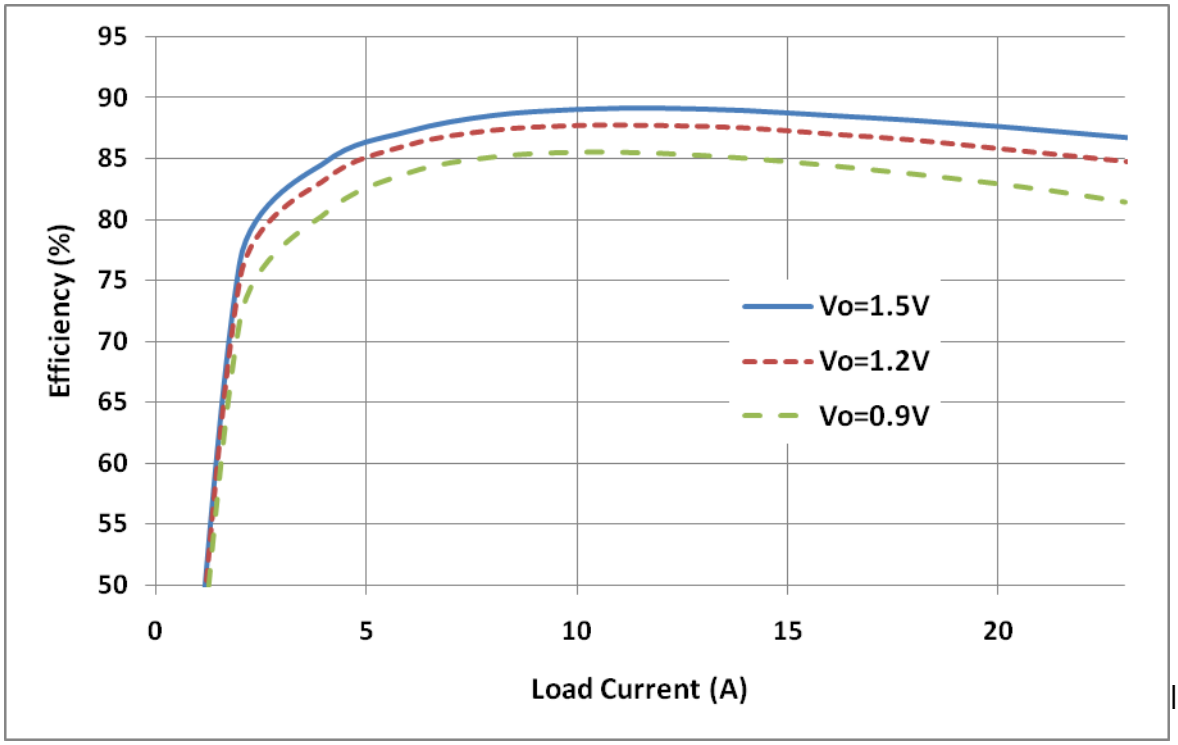
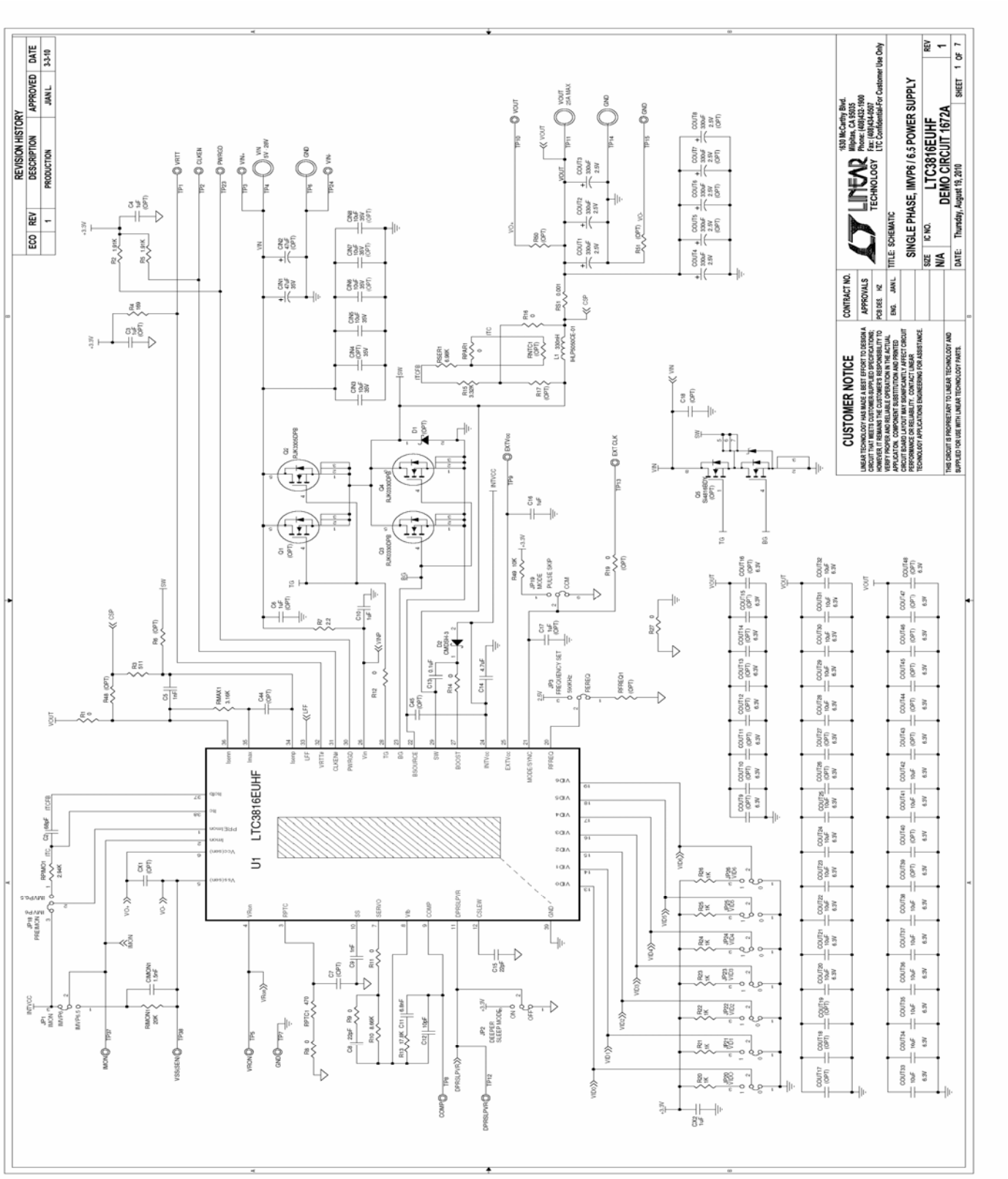
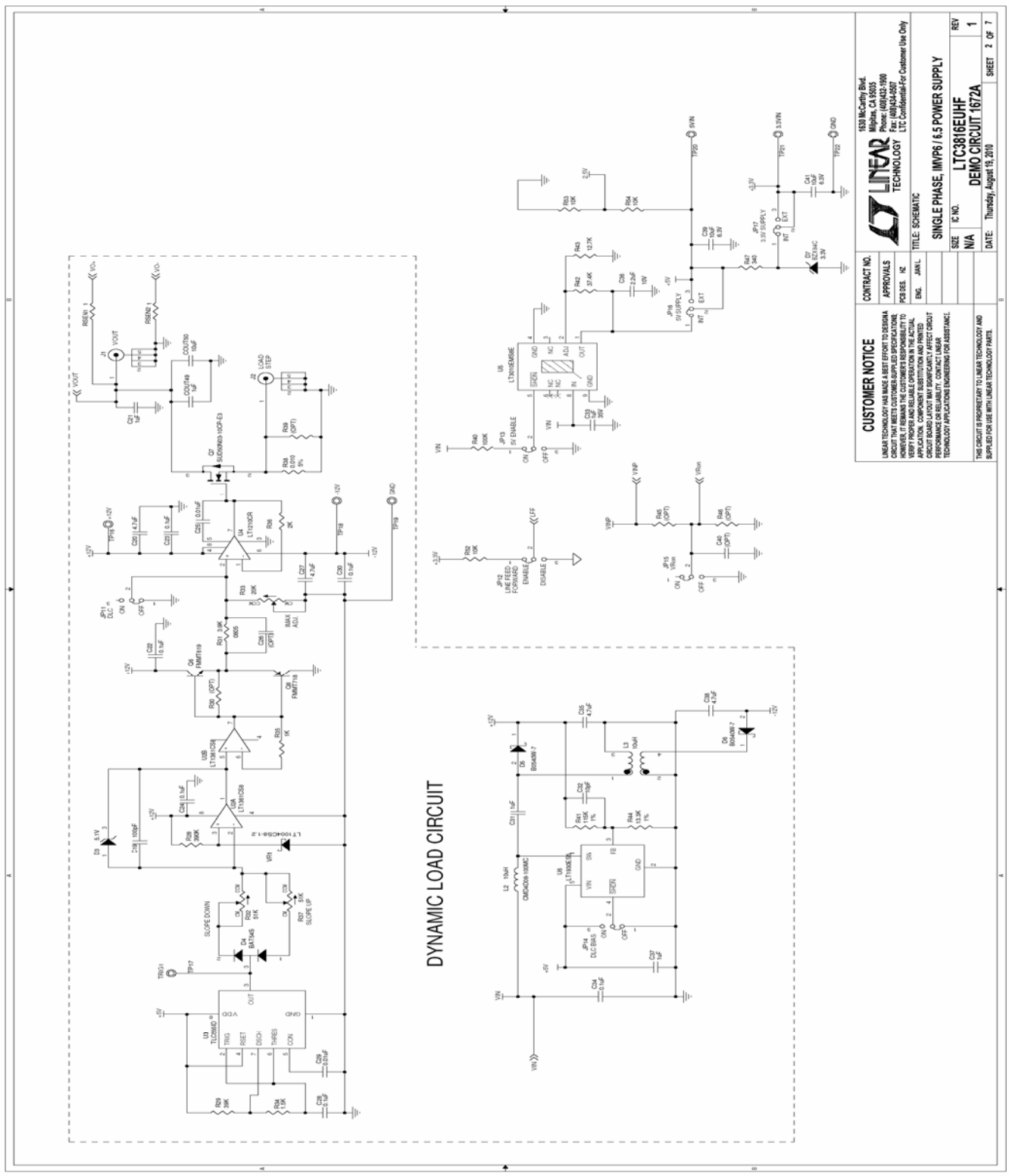
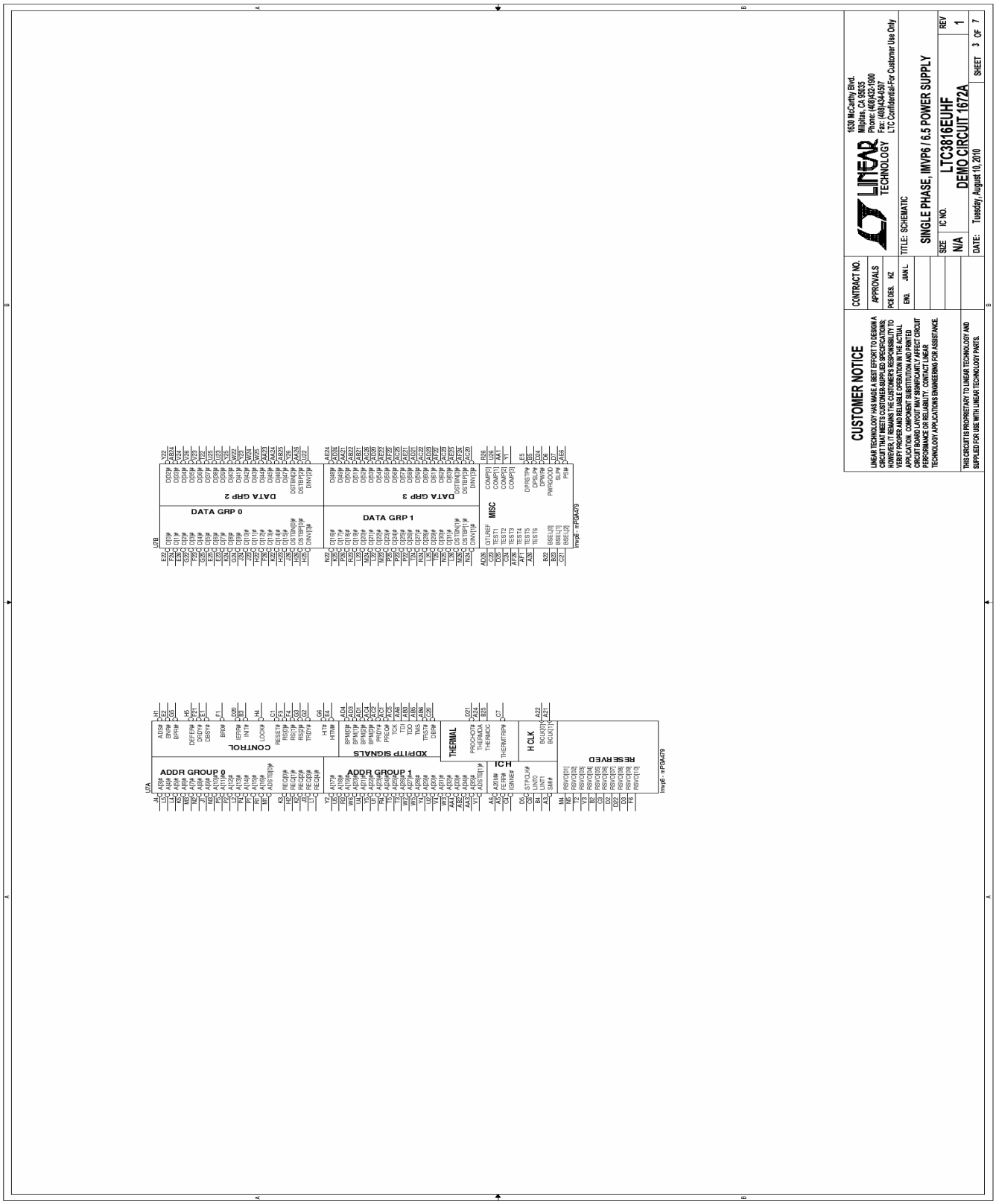
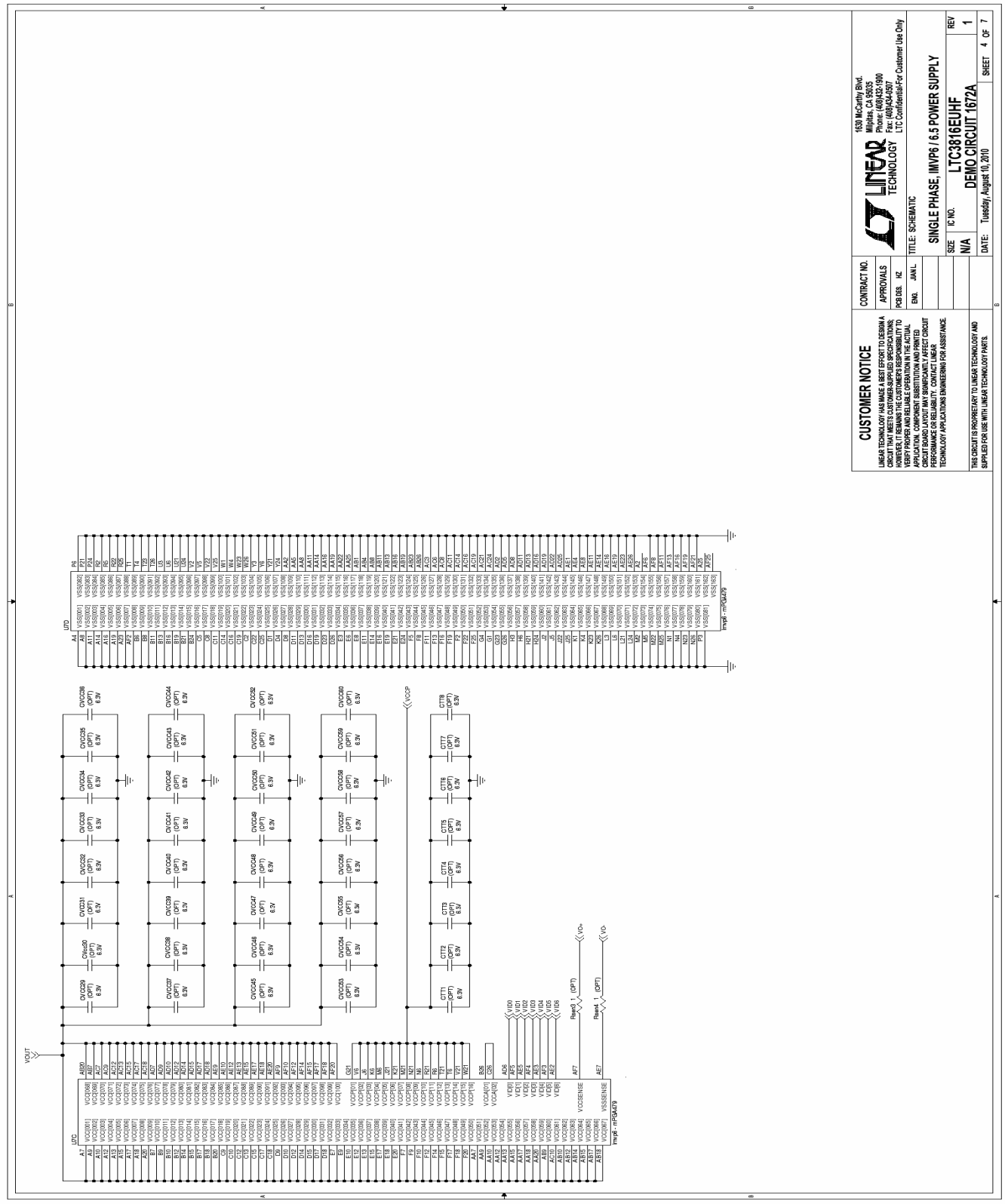


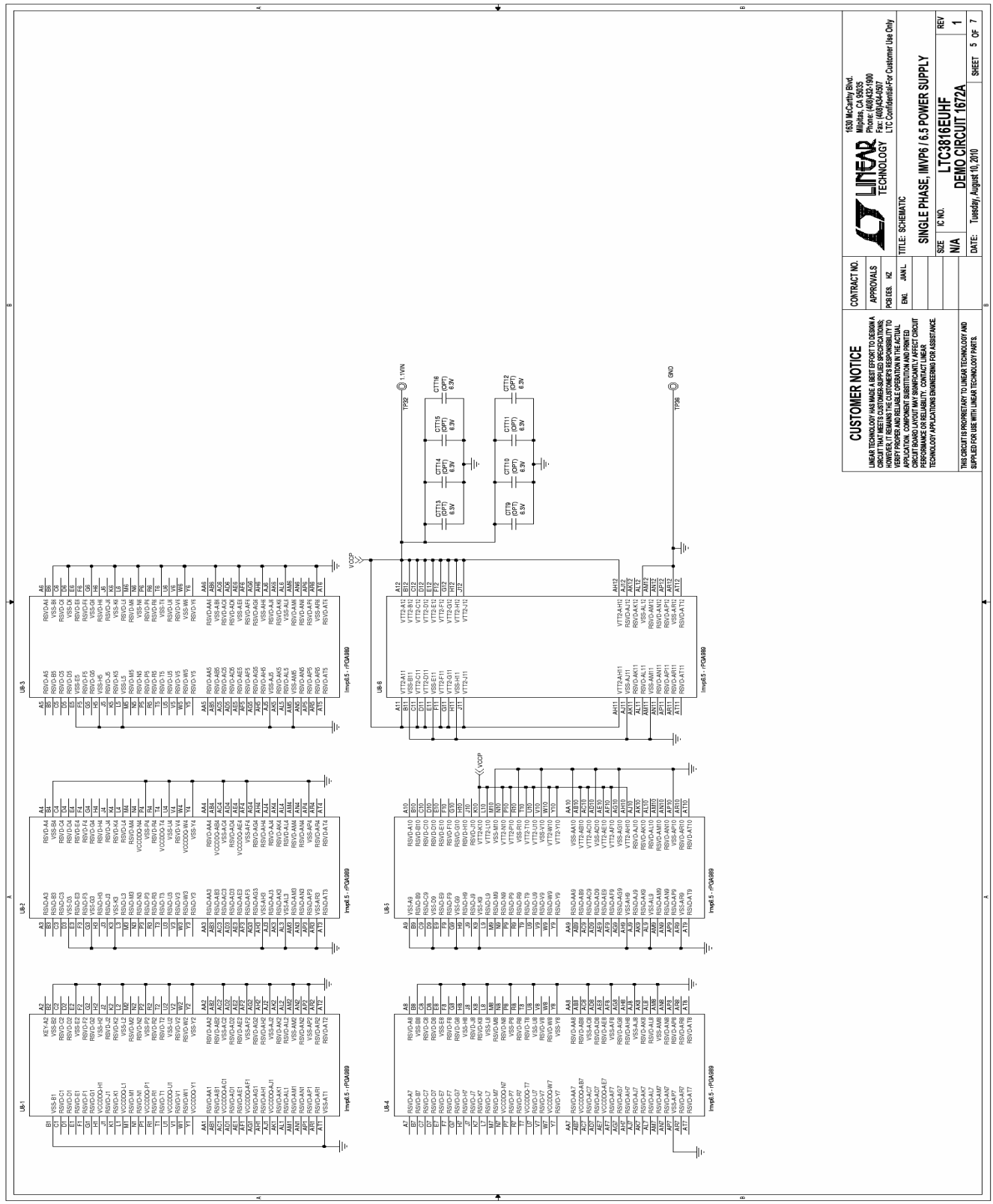
Figure 3. Efficiency vs load current

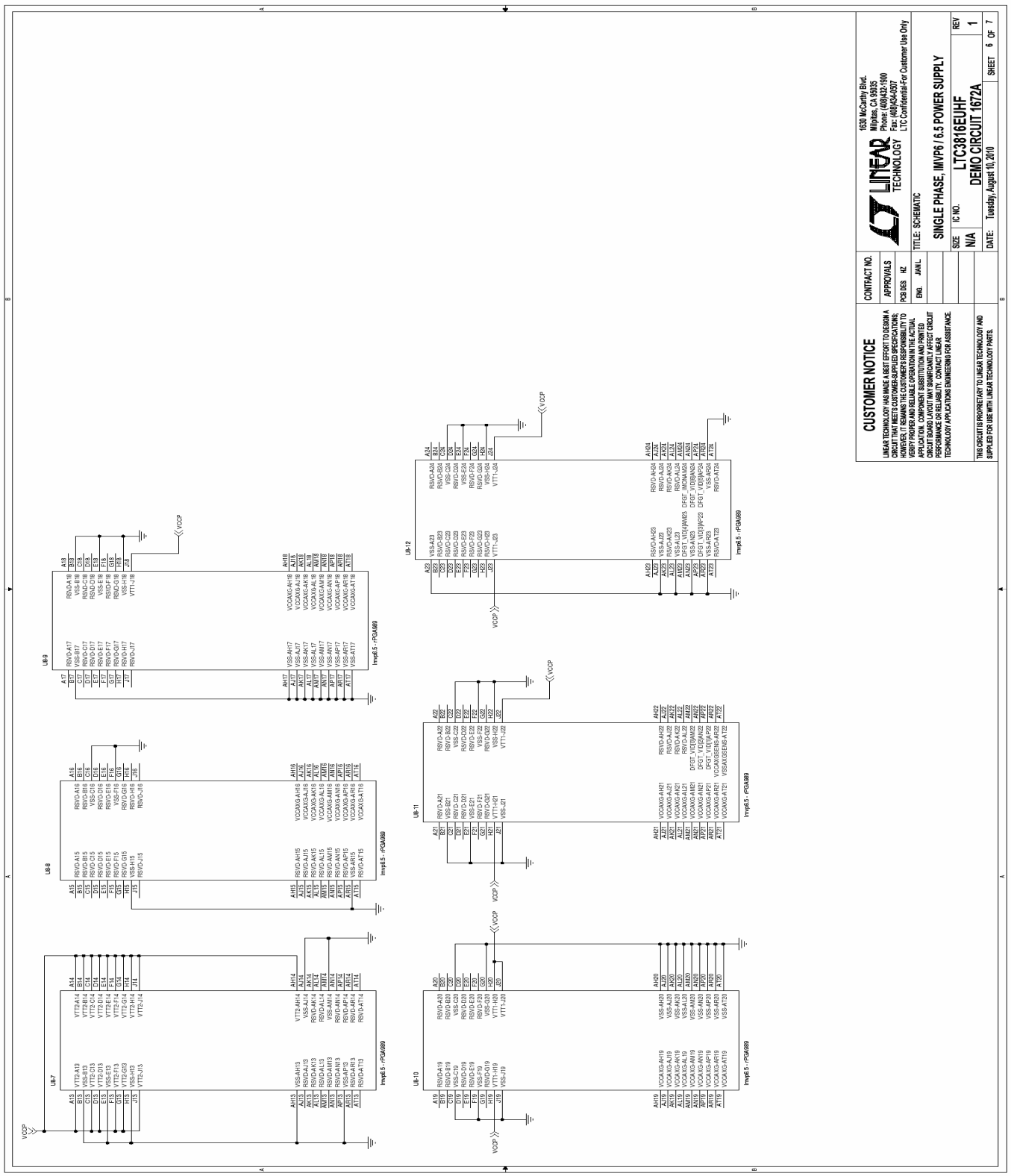

REVISION HISTORY
ECO REV DESCRIPTION APPROVED DATE
1 PRODUCTION JIAN L. 3-3-10
CUSTOMER NOTICE
LINEAR TECHNOLOGY HAS MADE A BEST EFFORT TO DESIGN A CIRCUIT THAT MEETS CUSTOMER-SUPPLIED SPECIFICATIONS; HOWEVER, IT REMAINS THE CUSTOMER'S RESPONSIBILITY TO VERIFY PROPER AND RELIABLE OPERATION IN THE ACTUAL APPLICATION. COMPONENT SUBSTITUTION AND PRINTED CIRCUIT BOARD LAYOUT MAY SIGNIFICANTLY AFFECT CIRCUIT PERFORMANCE OR RELIABILITY. CONTACT LINEAR TECHNOLOGY APPLICATIONS ENGINEERING FOR ASSISTANCE.
THIS CIRCUIT IS PROPRIETARY TO LINEAR TECHNOLOGY AND SUPPLIED FOR USE WITH LINEAR TECHNOLOGY PARTS.
CONTRACT NO.
APPROVALS
PCB DES. HZ
ENG. JIAN L.
1630 McCarthy Blvd.
Milpitas, CA 95035
Phone: (408)432-1900
Fax: (408)434-0507
LTC Confidential-For Customer Use Only
TECHNOLOGY
TITLE: SCHEMATIC
SINGLE PHASE, IMVP6 / 6.5 POWER SUPPLY
SIZE IC NO. LTC3816EUHF REV 1
N/A DEMO CIRCUIT 1672A
DATE: Thursday, August 19, 2010
SHEET 1 OF 7
U1 LTC3816EUHF

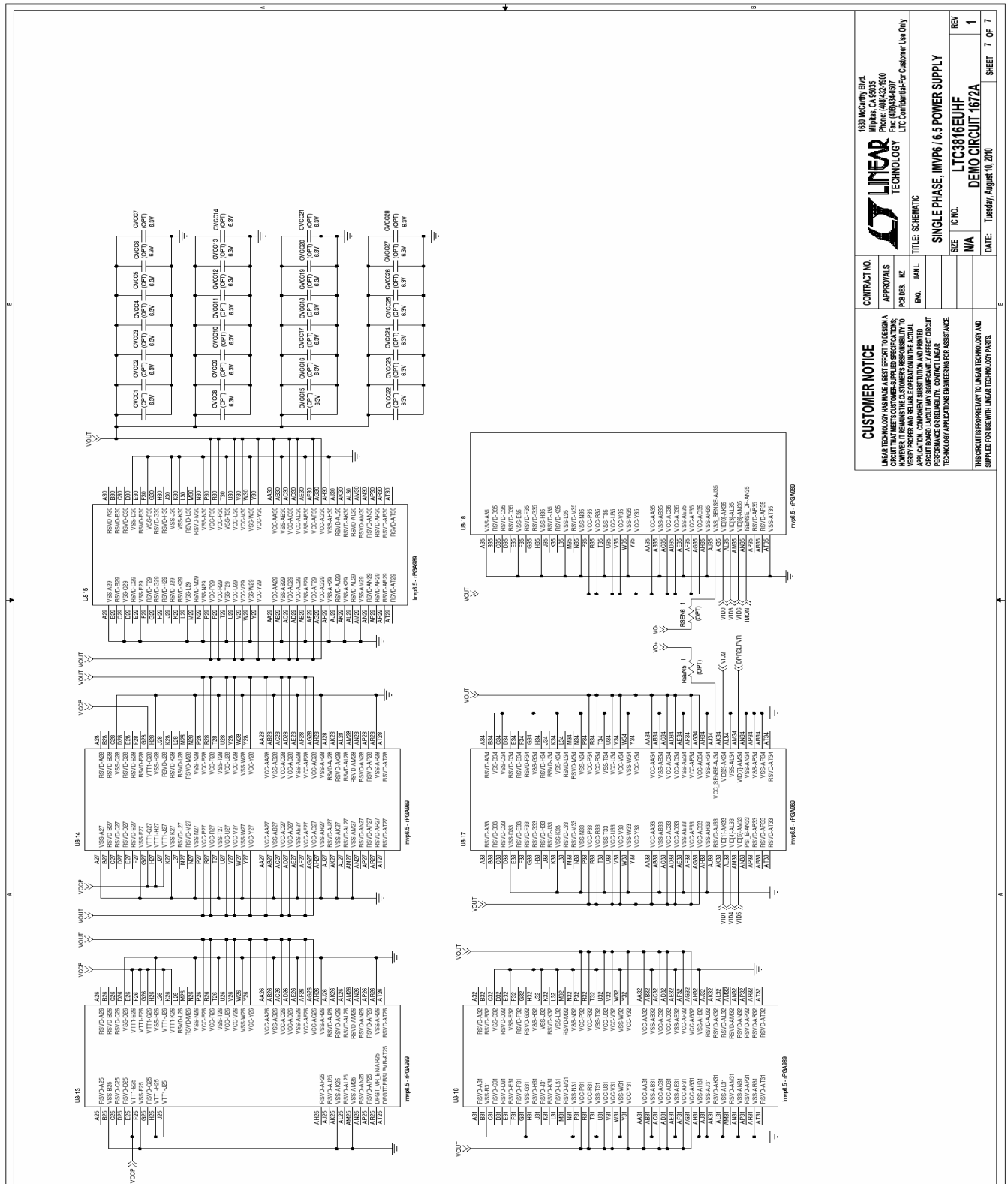

DYNAMIC LOAD CIRCUIT
SLOPE DOWN
SLOPE UP
CUSTOMER NOTICE
LINEAR TECHNOLOGY
1630 McCarthy Blvd.
Milpitas, CA 95035
Phone: (408)432-1900
Fax: (408)434-0507
LTC Confidential-For Customer Use Only
TITLE: SCHEMATIC
SINGLE PHASE, IMVP6 / 6.5 POWER SUPPLY
SIZE
N/A
IC NO.
LTC3816EUHF
DEMO CIRCUIT 1672A
REV
1
DATE: Thursday, August 19, 2010
SHEET 2 OF 7


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 DETERMINE WHETHER THE CIRCUIT MEETS THESE SPECIFICATIONS IN THE FINAL APPLICATION. COMPONENT SUBSTITUTION AND PRINTED CIRCUIT BOARD LAYOUT MAY SIGNIFICANTLY AFFECT CIRCUIT PERFORMANCE OR RELIABILITY. CONTACT LINEAR TECHNOLOGY APPLICATIONS ENGINEERING FOR ASSISTANCE.
THIS CIRCUIT IS PROPRIETARY TO LINEAR TECHNOLOGY AND SUPPLIED FOR USE WITH LINEAR TECHNOLOGY PARTS.
CONTRACT NO.
APPROVALS
PCB DES. HZ
ENG. JIAN L.
LINEAR TECHNOLOGY
1630 McCarthy Blvd.
Milpitas, CA 95035
Phone: (408)432-1900
Fax: (408)434-0507
LTC Confidential-For Customer Use Only
TITLE: SCHEMATIC
SINGLE PHASE, IMVP6 / 6.5 POWER SUPPLY
SIZE
IC NO.
N/A
LTC3816EUHF
DEMO CIRCUIT 1672A
REV
1
DATE: Tuesday, August 10, 2010
SHEET 3 OF 7


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.
CONTRACT NO.
APPROVALS
PCB DES. HZ
ENG. JANI L.
THIS CIRCUIT IS PROPRIETARY TO LINEAR TECHNOLOGY AND SUPPLIED FOR USE WITH LINEAR TECHNOLOGY PARTS.
1630 McCarthy Blvd.
Milpitas, CA 95035
Phone: (408)432-1900
Fax: (408)434-0507
LTC Confidential-For Customer Use Only
TITLE: SCHEMATIC
SINGLE PHASE, IMVP6 / 6.5 POWER SUPPLY
SIZE
N/A
IC NO.
LTC3816EUHF
DEMO CIRCUIT 1672A
REV
1
DATE: Tuesday, August 10, 2010
SHEET 4 OF 7


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.
THIS CIRCUIT IS PROPRIETARY TO LINEAR TECHNOLOGY AND SUPPLIED FOR USE WITH LINEAR TECHNOLOGY PARTS.
CONTRACT NO.
APPROVALS
PCB ES. N2
ENG. JIAN L.
1630 McCarthy Blvd.
Milpitas, CA 95035
Phone: (408)432-1900
Fax: (408)434-0507
LTC Confidential-For Customer Use Only
TITLE: SCHEMATIC
SINGLE PHASE, IMVP6 / 6.5 POWER SUPPLY
SIZE N/A
IC NO. LTC3816EUHF
DEMO CIRCUIT 1672A
REV 1
DATE: Tuesday, August 10, 2010
SHEET 5 OF 7
U8-1
U8-2
U8-3
U8-4
U8-5
U8-6
imvp6.5 - rPGA989
VCCP
1.1VIN
GND
TP32
TP38


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.
THIS CIRCUIT IS PROPRIETARY TO LINEAR TECHNOLOGY AND SUPPLIED FOR USE WITH LINEAR TECHNOLOGY PARTS.
CONTRACT NO.
APPROVALS
PCB DES. HZ
ENG. JIAN L.
LINEAR TECHNOLOGY
1630 McCarthy Blvd.
Milpitas, CA 95035
Phone: (408)432-1900
Fax: (408)434-0507
LTC Confidential-For Customer Use Only
TITLE: SCHEMATIC
SINGLE PHASE, IMVP6 / 6.5 POWER SUPPLY
SIZE
N/A
IC NO.
LTC3816EUHF
DEMO CIRCUIT 1672A
REV
1
DATE: Tuesday, August 10, 2010
SHEET 6 OF 7


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.
CONTRACT NO.
APPROVALS
PCB DES. HZ
ENG. JIAN L
LINEAR TECHNOLOGY
1630 McCarthy Blvd.
Milpitas, CA 95035
Phone: (408)432-1900
Fax: (408)434-0507
LTC Confidential–For Customer Use Only
TITLE: SCHEMATIC
SINGLE PHASE, IMVP6 / 6.5 POWER SUPPLY
SIZE
K, NO.
N/A
LTC3816EUHF
DEMO CIRCUIT 1672A
REV
1
DATE: Tuesday, August 10, 2010
SHEET 7 OF 7
THIS CIRCUIT IS PROPRIETARY TO LINEAR TECHNOLOGY AND SUPPLIED FOR USE WITH LINEAR TECHNOLOGY PARTS.
U8.13
U8.14
U8.15
U8.16
U8.17
U8.18
Imvp6.5 - rPGA989
VOUT
VCCP
VCC
VID0
VID1
VID2
VID3
VID4
VID5
VID6
IMON
DPRSLPVR
VO-
VO+
RSENS 1
(OPT)
CVCC1 (OPT) 6.3V
CVCC2 (OPT) 6.3V
CVCC3 (OPT) 6.3V
CVCC4 (OPT) 6.3V
CVCC5 (OPT) 6.3V
CVCC6 (OPT) 6.3V
CVCC7 (OPT) 6.3V
CVCC8 (OPT) 6.3V
CVCC9 (OPT) 6.3V
CVCC10 (OPT) 6.3V
CVCC11 (OPT) 6.3V
CVCC12 (OPT) 6.3V
CVCC13 (OPT) 6.3V
CVCC14 (OPT) 6.3V
CVCC15 (OPT) 6.3V
CVCC16 (OPT) 6.3V
CVCC17 (OPT) 6.3V
CVCC18 (OPT) 6.3V
CVCC19 (OPT) 6.3V
CVCC20 (OPT) 6.3V
CVCC21 (OPT) 6.3V
CVCC22 (OPT) 6.3V
CVCC23 (OPT) 6.3V
CVCC24 (OPT) 6.3V
CVCC25 (OPT) 6.3V
CVCC26 (OPT) 6.3V
CVCC27 (OPT) 6.3V
CVCC28 (OPT) 6.3V