

LTM4639

Low V_{IN} 20A DC/DC μModule Step-Down Regulator

DESCRIPTION

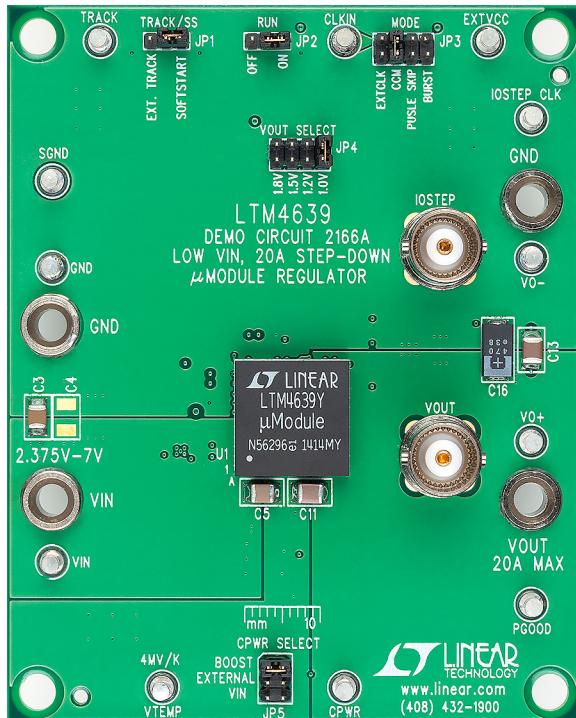
Demonstration circuit 2166A features the LTM®4639EY, a 20A high efficiency, switch mode step-down power µModule® regulator. The input voltage range is from 2.375V to 7V. The output voltage range is 0.6V to 5.5V. Derating is necessary for certain V_{IN} , V_{OUT} , frequency and thermal conditions. The DC2166A offers the TRACK/SS pin allowing the user to program output tracking or soft-start period. The board operates in continuous conduction mode in heavy load conditions. For high efficiency at low load currents, the MODE jumper (JP3) selects pulse-skipping mode for noise sensitive applications or Burst Mode® operation in less noise sensitive applications. There is an

on board boost circuit using LT1935 to provide control power to LTM4639 when V_{IN} is less than 4.5V. LTM4639 has on board diode connected PNP transistors to monitor its internal temperature. A temperature sensor LTC2997 converts the internal temperature to an analog voltage output. The LTM4639 data sheet must be read in conjunction with this demo manual prior to working on or modifying demo circuit DC2166A.

**Design files for this circuit board are available at
<http://www.linear.com/demo/DC2166A>**

LT, LT, LTC, LTM, µModule, Burst Mode, Linear Technology and the Linear logo are registered trademarks of Linear Technology Corporation. All other trademarks are the property of their respective owners.

BOARD PHOTO



DEMO MANUAL DC2166A

PERFORMANCE SUMMARY

PARAMETER	CONDITIONS/NOTES	VALUE
Input Voltage Range		2.375V to 7V
Output Voltages		1.0V, 1.2V, 1.5V, 1.8V \pm 1.5%
Maximum Continuous Output Current	Derating is necessary for certain operating conditions. See data sheet for details.	20ADC
Operating Frequency		500kHz
Efficiency	$V_{IN} = 3.3V$, $I_{OUT} = 20A$	83.2% ($V_{OUT1} = 1.0V$) (Figure 2) 85.3% ($V_{OUT1} = 1.2V$) (Figure 2) 87.7% ($V_{OUT1} = 1.5V$) (Figure 2) 89.1% ($V_{OUT1} = 1.8V$) (Figure 2)
Load Transient	$V_{IN} = 3.3V$, $V_{OUT} = 1.0V$, $I_{STEP} = 0A$ to $10A$	156mV (Figure 4)

QUICK START PROCEDURE

Demonstration circuit DC2166A is an easy way to evaluate the performance of the LTM4639EY. Please refer to Figure 1 for proper measurement equipment setup and follow the procedure below:

1. Place jumpers in the following positions for a typical application:

RUN	TRACK/SS	MODE	V_{OUT} SELECT	CPWR SELECT
ON	SOFT-START	CCM	1.0V	BOOST
2. With power off, connect the input power supply, load and meters as shown in Figure 1. Preset the load to 0A and V_{IN} supply to 3.3V.
3. Turn on the power supply at the input. The output voltage should be $1.0V \pm 1.5\%$ (0.985V to 1.015V).
4. Vary the input voltage from 2.375V to 7V and adjust the load current from 0A to 20A. Observe the output voltage regulation, ripple voltage, efficiency, and other parameters.

5. (Optional) For optional load transient test, apply an adjustable pulse signal between IOSTEP_CLK and GND test points. The pulse amplitude sets the load step current amplitude. Keep the pulse width short (<1ms) and pulse duty cycle low (<5%) to limit the thermal stress on the load transient circuit.
6. (Optional) LTM4639 can be synchronized to an external clock signal. Place the JP3 jumper on EXTCLK and apply a clock signal (0V to 5V, square wave) on the CLKIN test point.
7. (Optional) The outputs of LTM4639 can track another supply by setting JP1 to EXT TRACK. If tracking external voltage is selected, the corresponding test point TRACK need to be connected to a valid voltage signal.

DEMO MANUAL DC2166A

QUICK START PROCEDURE

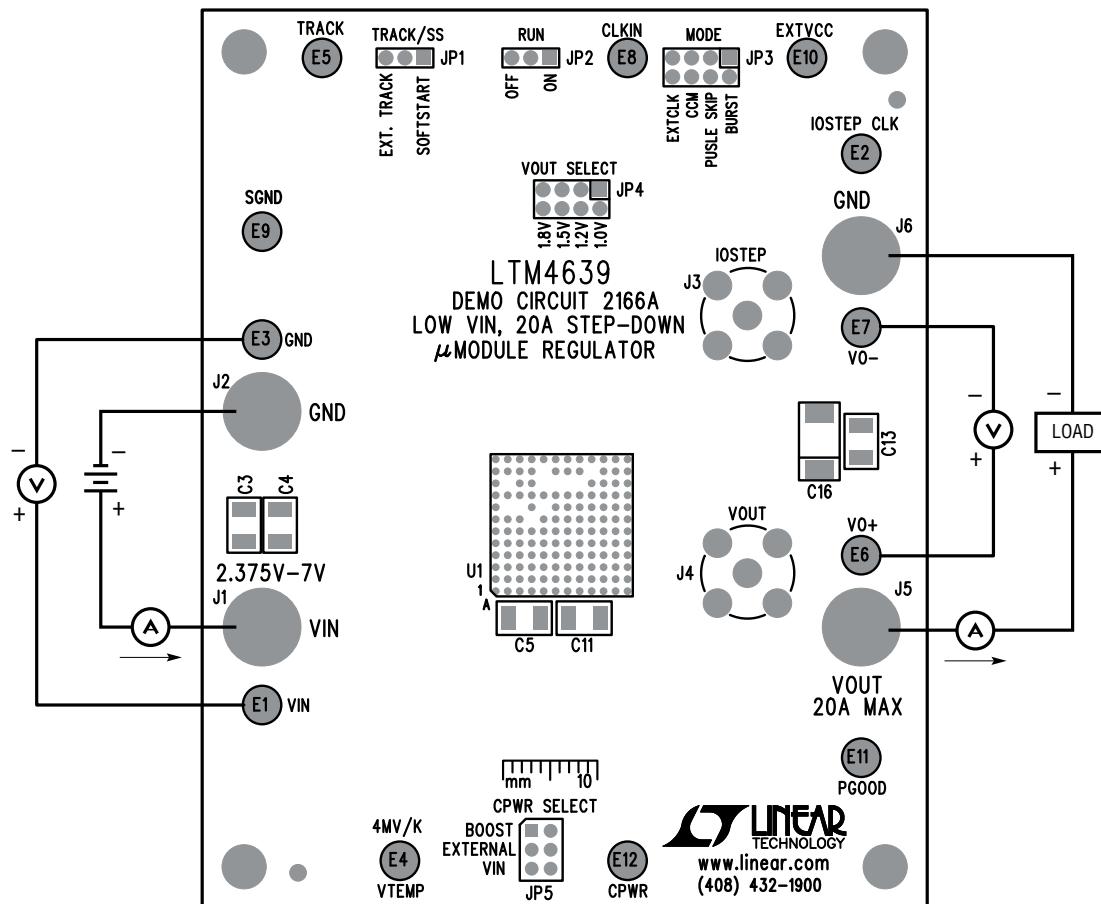


Figure 1. Measurement Setup of DC2166A

DEMO MANUAL DC2166A

QUICK START PROCEDURE

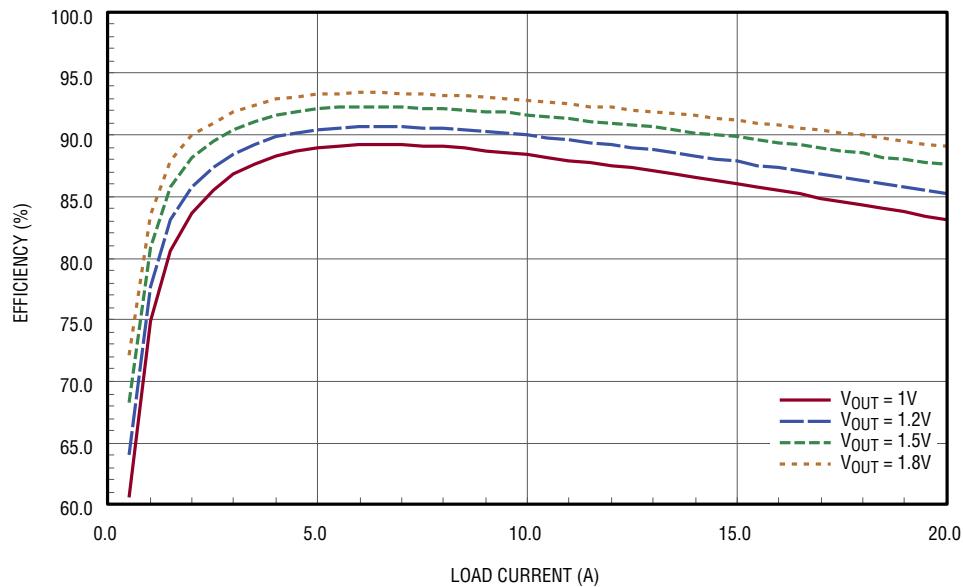


Figure 2. Measured Efficiency at $V_{IN} = 3.3V$, $f_{SW} = 500kHz$, CCM

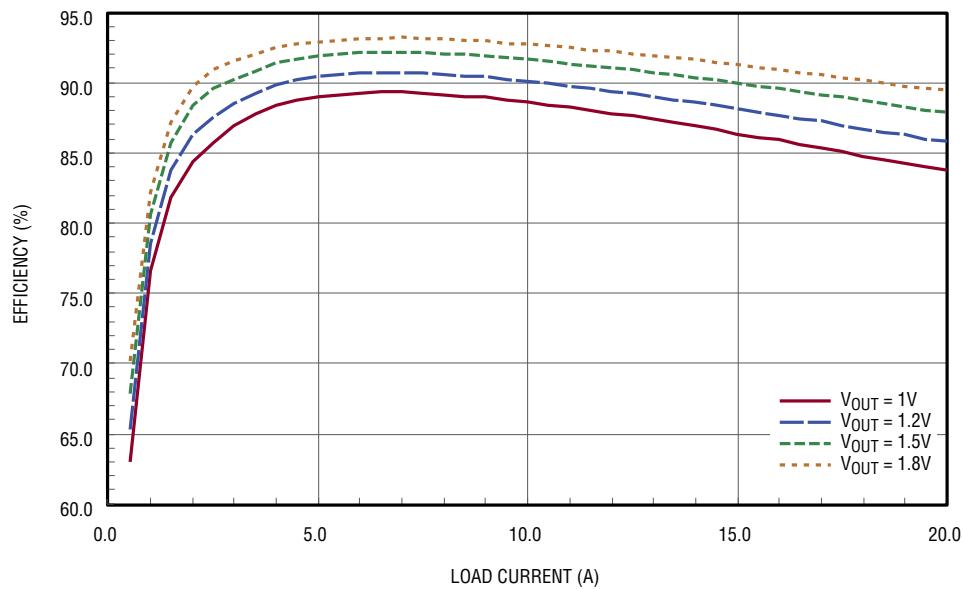


Figure 3. Measured Efficiency at $V_{IN} = 5.0V$, $f_{SW} = 500kHz$, CCM

QUICK START PROCEDURE

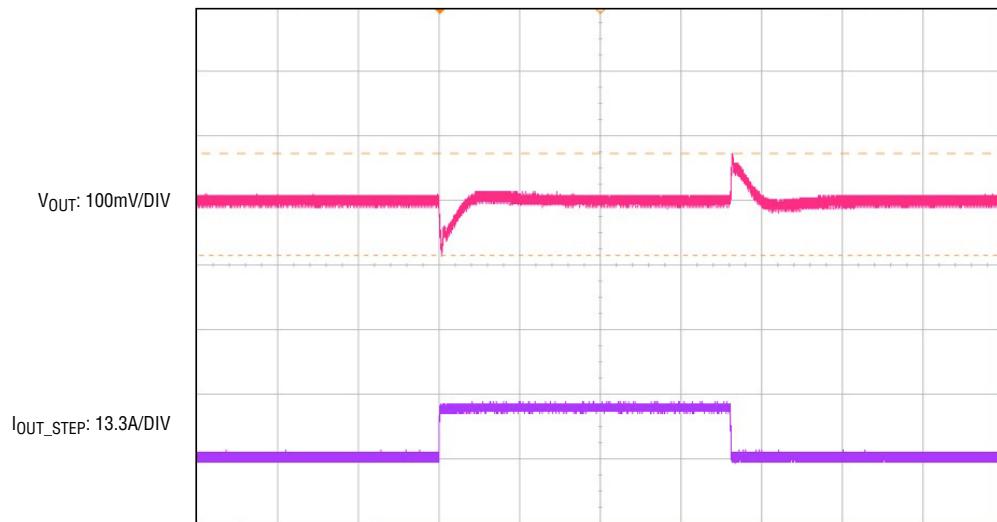


Figure 4. Measured Load Transient
 $V_{IN} = 3.3V$, $V_{OUT1} = 1.0V$, $I_{STEP} = 0A$ to $10A$

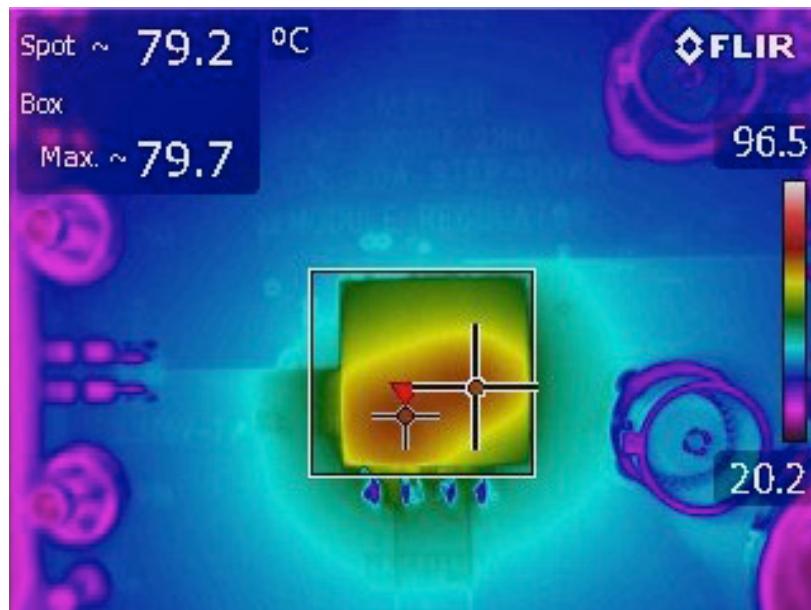


Figure 5. Thermal Image of LTM4639
 $V_{IN} = 3.3V$, $V_{OUT} = 1.8V$, $I_{LOAD} = 20A$
Ambient Temperature = 23.3°C , No Forced Air Flow

DEMO MANUAL DC2166A

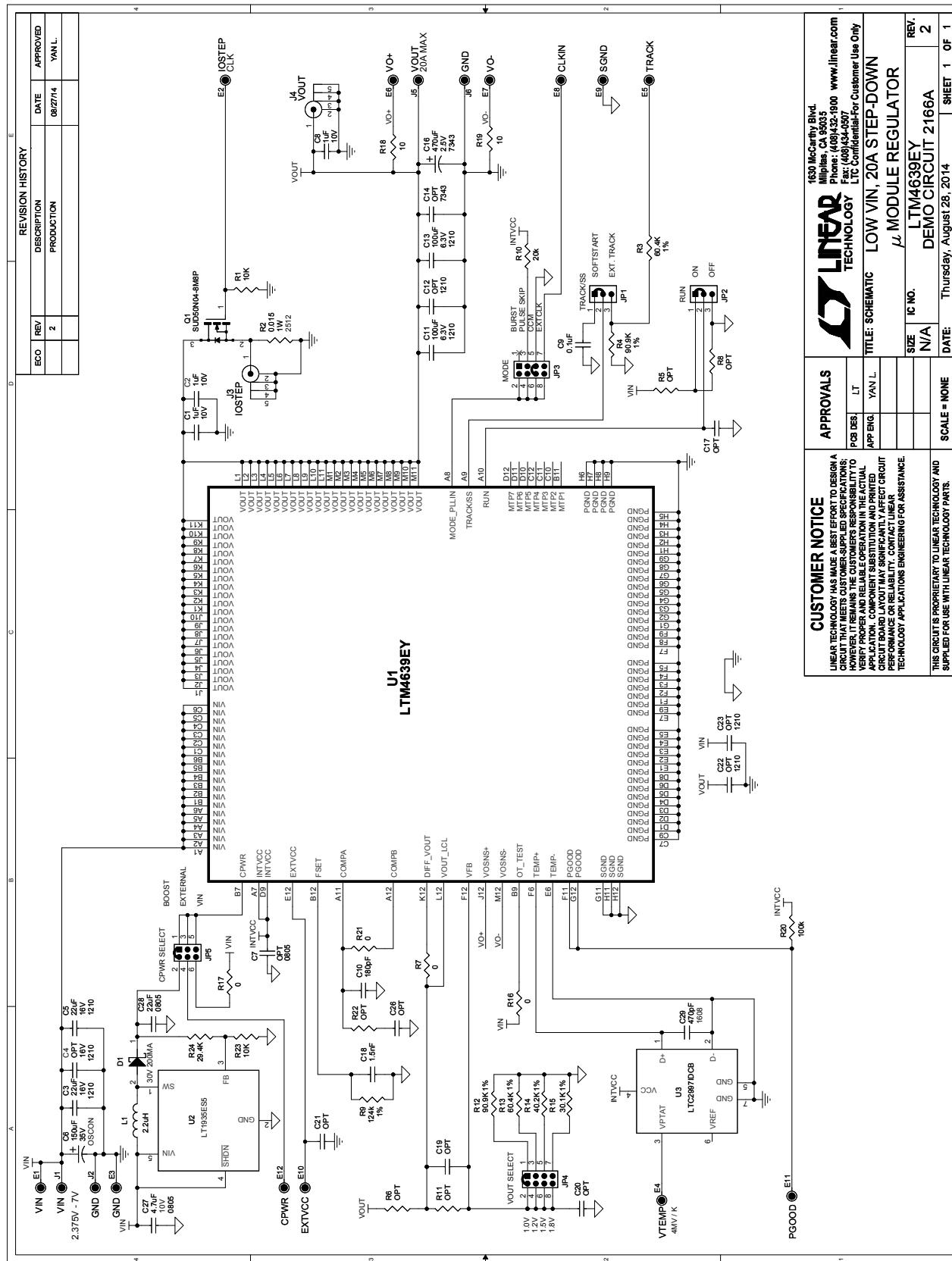
PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Required Circuit Components				
1	2	C3, C5	CAP, 1210, 22µF, 10%, 16V, X5R	MURATA GRM32ER61E226KE20L
2	1	C6	CAP, 150µF, 35V, ELEC	SUN ELEC 35CE150AX
3	1	C9	CAP, 0603, 0.1µF, 10%, 50V, X7R	TDK C1608X7R1H104K
4	1	C10	CAP, 0603, 180pF, 10%, 10V, X7R	AVX, 0603ZC181KAT2A
5	2	C11, C13	CAP, 1210, 100µF, 20%, 6.3V, X5R	TDK C3225X5R0J107M
6	1	C16	CAP, 7343, 470µF, 20%, 2.5V POSCAP	PANASONIC 2R5TPE470M9
7	1	C18	CAP, 0603, 1.5nF, 5%, 25V, X7R	AVX 06033C152JAT2A
8	1	R13	RES, 0603, 60.4kΩ, 1%, 1/10W	VISHAY CRCW060360K4FKEA
9	1	R12	RES, 0603, 90.9kΩ, 1%, 1/10W	VISHAY CRCW060390K9FKEA
10	1	R9	RES, 0603, 124kΩ, 1%, 1/10W	VISHAY CRCW0603124K0FKEA
11	1	R14	RES, 0603, 40.2kΩ, 1%, 1/10W	VISHAY CRCW060340K2FKEA
12	1	R15	RES, 0603, 30.1kΩ, 1%, 1/10W	VISHAY CRCW060330K1FKEA
13	1	R20	RES, 0603, 100kΩ, 5%, 1/10W	VISHAY CRCW0603100KJNEA
14	1	U1	IC, LTM4639EY	LINEAR TECH LTM4639EY#PBF
Additional Demo Board Circuit Components				
1	3	C1, C2, C8	CAP, 0603, 1µF, 20%, 10V, X5R	TDK, C1608X5R1A105M
2	0	C4, C12, C22, C23	CAP, 1210 OPTION	OPTION
3	0	C7	CAP, 0805 OPTION	OPTION
4	0	C14	CAP, 7343 OPTION	OPTION
5	0	C17, C19, C20, C21, C26	CAP, 0603 OPTION	OPTION
6	1	C27	CAP, 0805, 4.7µF, 20%, 10V, X7R	TDK C2012X7R1A475M
7	1	C28	CAP, 0805, 22µF, 10%, 16V, X5R	TDK C2012X5R1C226K
8	1	C29	CAP, 0603, 470pF, 10%, 10V, X7R	AVX, 0603ZC471KAT2A
9	1	D1	DIODE, SCHOTTKY 30V	ON SEMI NSR0230P2T5G
10	1	L1	IND, 2.2µH, 2012	TAIYO YUDEN CBC2012T2R2M
11	1	Q1	XSTR, MOSFET, N-CHANNEL 30V	VISHAY SUD50N04-8M8P-4GE3
12	2	R1, R23	RES, 0603, 10kΩ, 5%, 1/10W	VISHAY CRCW060310K0JNEA
13	1	R2	RES, 2512, 0.015Ω, 1%, 1W	VISHAY WSL2512R0150FEA
14	1	R3	RES, 0603, 60.4kΩ, 1%, 1/10W	VISHAY CRCW060360K4FKEA
15	1	R4	RES, 0603, 90.9kΩ, 1%, 1/10W	VISHAY CRCW060390K9FKEA
16	0	R5, R6, R8, R11, R22	RES, 0603 OPTION	OPTION
17	4	R7, R16, R17, R21	RES, 0603, 0Ω JUMPER	VISHAY CRCW06030000Z0ED
18	1	R10	RES, 0603, 20kΩ, 5%, 1/10W	VISHAY CRCW060320K0JNEA
19	2	R18, R19	RES, 0603, 10Ω, 5%, 1/10W	VISHAY CRCW060310R0JNEA
20	1	R24	RES, 0603, 29.4kΩ, 1% 1/10W	VISHAY CRCW060329K4FKEA
21	1	U2	IC, LT1935AES5	LINEAR TECH. LT1935ES5#PBF
22	1	U3	IC, LTC2997IDCB	LINEAR TECH., LTC2997IDCB#PBF
Hardware				
1	12	E1-E12	TESTPOINT, TURRET, .094"	MILL-MAX 2501-2-00-80-00-00-07-0
2	2	JP1, JP2	HEADER, 1 × 3 , 2mm	SULINS, NRPN031PAEN-RC
3	2	JP3, JP4	HEADER, 2 × 4, DOUBLE ROW, 2mm	SULINS, NRPN042PAEN-RC
4	2	JP5	HEADER, 2 × 3, DOUBLE ROW, 2mm	SULINS, NRPN032PAEN-RC
5	4	J1, J2, J5, J6	JACK, BANANA	KEYSTONE 575-4
6	2	J3,J4	CONN., VERT. PC-MNT, BNC 50Ω	CONNEX 112404
7	5	XJP1, XJP2, XJP3, XJP4, XJP5	SHUNT	SAMTEC 2SN-BK-G
8	4	MH1, MH2, MH3, MH4	STANDOFF, SNAP ON	KEYSTONE_8834
9	2		STENCILS TOP AND BOTTOM	STENCIL DC2166A

dc2166af

DEMO MANUAL DC2166A

SCHEMATIC DIAGRAM



DEMO MANUAL DC2166A

DEMONSTRATION BOARD IMPORTANT NOTICE

Linear Technology Corporation (LTC) provides the enclosed product(s) under the following **AS IS** conditions:

This demonstration board (DEMO BOARD) kit being sold or provided by Linear Technology is intended for use for **ENGINEERING DEVELOPMENT OR EVALUATION PURPOSES ONLY** and is not provided by LTC for commercial use. As such, the DEMO BOARD herein may not be complete in terms of required design-, marketing-, and/or manufacturing-related protective considerations, including but not limited to product safety measures typically found in finished commercial goods. As a prototype, this product does not fall within the scope of the European Union directive on electromagnetic compatibility and therefore may or may not meet the technical requirements of the directive, or other regulations.

If this evaluation kit does not meet the specifications recited in the DEMO BOARD manual the kit may be returned within 30 days from the date of delivery for a full refund. THE FOREGOING WARRANTY IS THE EXCLUSIVE WARRANTY MADE BY THE SELLER TO BUYER AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED, OR STATUTORY, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. EXCEPT TO THE EXTENT OF THIS INDEMNITY, NEITHER PARTY SHALL BE LIABLE TO THE OTHER FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES.

The user assumes all responsibility and liability for proper and safe handling of the goods. Further, the user releases LTC from all claims arising from the handling or use of the goods. Due to the open construction of the product, it is the user's responsibility to take any and all appropriate precautions with regard to electrostatic discharge. Also be aware that the products herein may not be regulatory compliant or agency certified (FCC, UL, CE, etc.).

No license is granted under any patent right or other intellectual property whatsoever. **LTC assumes no liability for applications assistance, customer product design, software performance, or infringement of patents or any other intellectual property rights of any kind.**

LTC currently services a variety of customers for products around the world, and therefore this transaction **is not exclusive**.

Please read the DEMO BOARD manual prior to handling the product. Persons handling this product must have electronics training and observe good laboratory practice standards. **Common sense is encouraged.**

This notice contains important safety information about temperatures and voltages. For further safety concerns, please contact a LTC application engineer.

Mailing Address:

Linear Technology
1630 McCarthy Blvd.
Milpitas, CA 95035

Copyright © 2004, Linear Technology Corporation

dc2166af



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

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помошь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помошь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



Как с нами связаться

Телефон: 8 (812) 309 58 32 (многоканальный)

Факс: 8 (812) 320-02-42

Электронная почта: org@eplast1.ru

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.