ADP1829 Reference Design

Preliminary Technical Data

FCDC 00062

FEATURES

Five Output Voltages: 1.0V, 1.8V, 3.3V x 2, 5V
Output Current: 0.7A to 2.8A
Input voltage: 9-12V
Ripple 2% ppk of Output Voltage
Transient step ±5%, 50% max load

ADP1829 REFERENCE DESIGN DESCRIPTION

This ADP1829 Reference Design is a paper only design. The reference design uses 9V to 12V for in the input voltage. The output voltages and currents are as follows: V_{OUT1} = 1.0 V with a maximum output current of 2.8 A, V_{OUT2} = 1.8V with a maximum output current of 0.8A, V_{OUT3} = 3.3 V with a maximum output current of 0.7 A, V_{OUT4} = 5.0 V with a maximum output current of 0.5 A and V_{OUT5} = 3.3 V with a maximum output current of 0.7 A.

Design criteria are for sequencing in the order: V_{OUT3} then V_{OUT2} then V_{OUT1}. No ripple or transient specification were supplied so assumptions of 2% peak to peak voltage ripple and 5% deviation due to 50% instantaneous load step are used, unless other capacitors are present on the main board. The RF outputs are designed with extremely low ripple (<1mV) and have a second filter stage to remove high frequency switching noise. The switching frequency is fixed at 300kHz for all switching outputs. Synchronization can be implemented by a resistor stuffing option.

One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106, U.S.A.
Tel: 781.329.4700 **www.analog.com**
Fax: 781.461.3113

TABLE OF CONTENTS

Features 1
ADP1829 Reference Design Description 1
Revision History 2
GENERAL DESCRIPTION 3
ADP1829 3
ADP1706/ADP1708 3
Typical Performance Characteristics 4
Schematic 6
Bill of Materials 8

TABLE OF FIGURES

Figure 1. Calculated efficiency of 1.0V output 4
Figure 2. Calculated efficiency of 1.8V output 4
Figure 3. Calculated efficiency of 3.8V output 5
Figure 4. Calculated efficiency of 5.4V output 5
Figure 5. ADP1829 Reference Design Schematic 6

REVISION HISTORY

10/3/2007—Revision 0: Initial Version
10/4/2007—Revision 1: Added linear to 5V output, labeled Signal ground for each switcher

GENERAL DESCRIPTION

ADP1829

The ADP1829 is a versatile, dual output, interleaved, synchronous PWM buck controller that generates two independent outputs from an input voltage of 2.9 V to 20 V. Each channel can be configured to provide output voltage from 0.6V to 85% of the input voltage. The two channels operate 180° out of phase, which reduces the current stress on the input capacitor and allows the use of a smaller and lower cost input capacitor.

The ADP1829 operates at a pin-selectable fixed switching frequency of either 300 kHz or 600 kHz. For some noise sensitive applications, it can also be synchronized to an external clock to achieve switching frequency between 300 kHz and 1 MHz. The switching frequency chosen is 300 kHz to get good efficiency over a wide range of input and output conditions.

The ADP1829 includes an adjustable soft start to limit input inrush current, voltage tracking for sequencing or DDR termination, independent power-good output, and a power enable pin. It also provides current-limit and short-circuit protection by sensing the voltage on the synchronous MOSFET.

ADP1706/ADP1708

The ADP170X is a family of low drop out CMOS linear regulators that provides versatile and inexpensive step-down voltage regulation. The input voltage range is 2.5 V to 5.5 V and the output current capability is up to 1 A. The various versions provide features such as Enable, Soft Start and Tracking. They are available is space saving LFCSP-8 and SOIC-8 packages and operate over the –40°C to +125°C temperature range.

TYPICAL PERFORMANCE CHARACTERISTICS

Figure 1. Calculated efficiency of 1.0V output

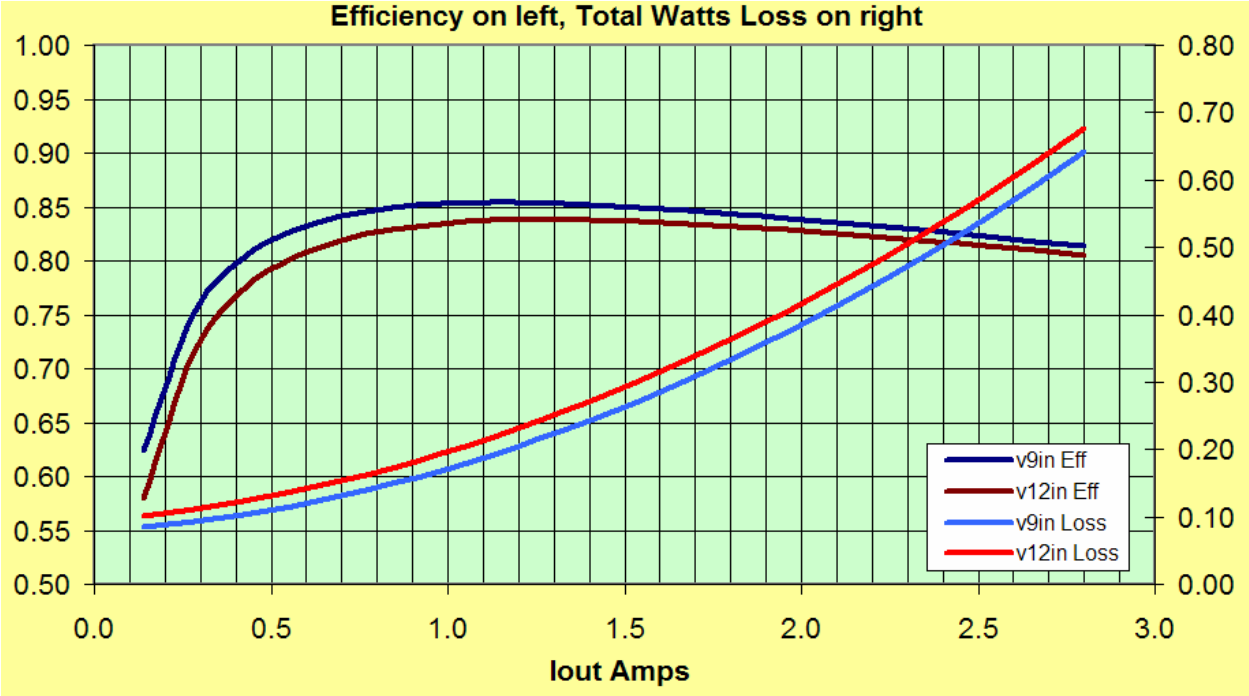


Figure 2. Calculated efficiency of 1.8V output

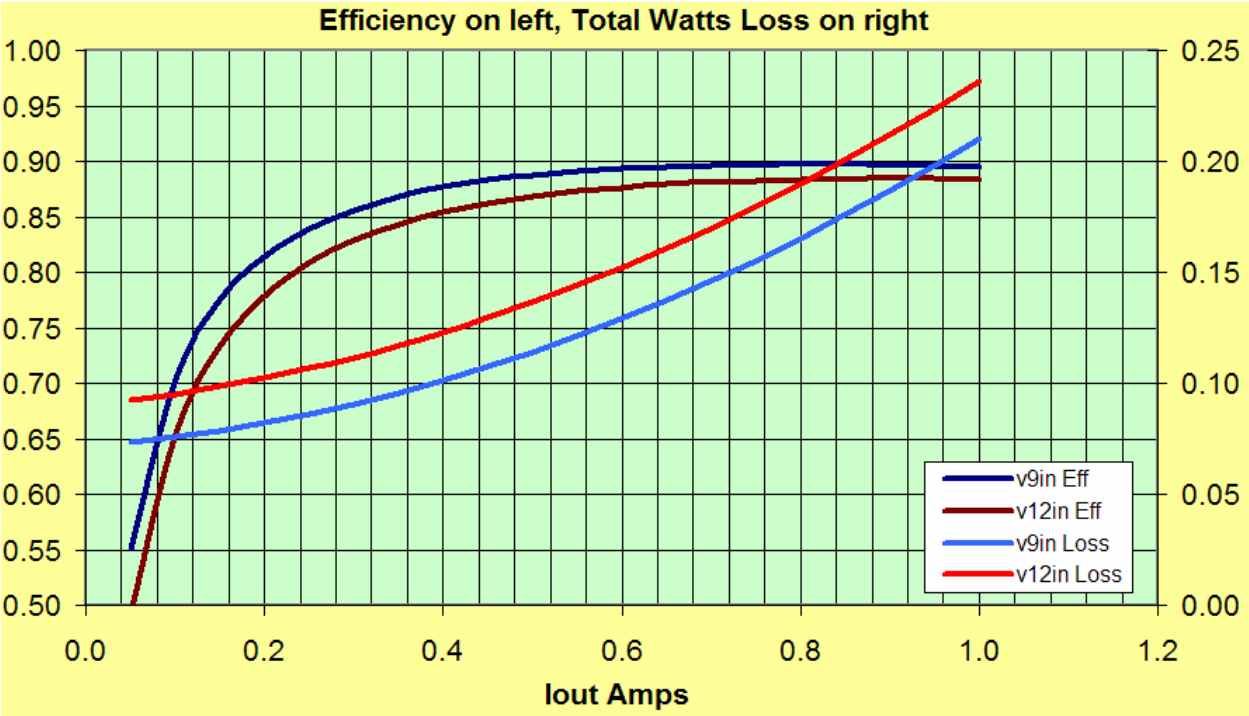


Figure 3. Calculated efficiency of 3.8V output

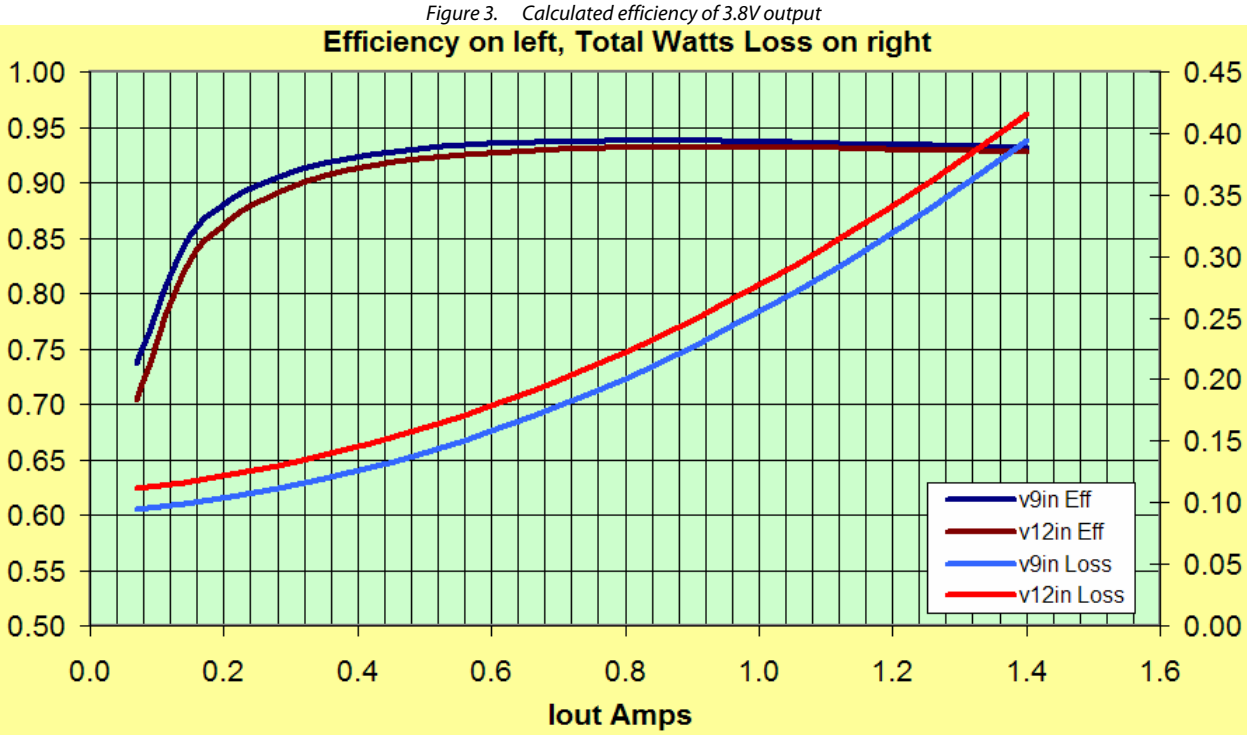
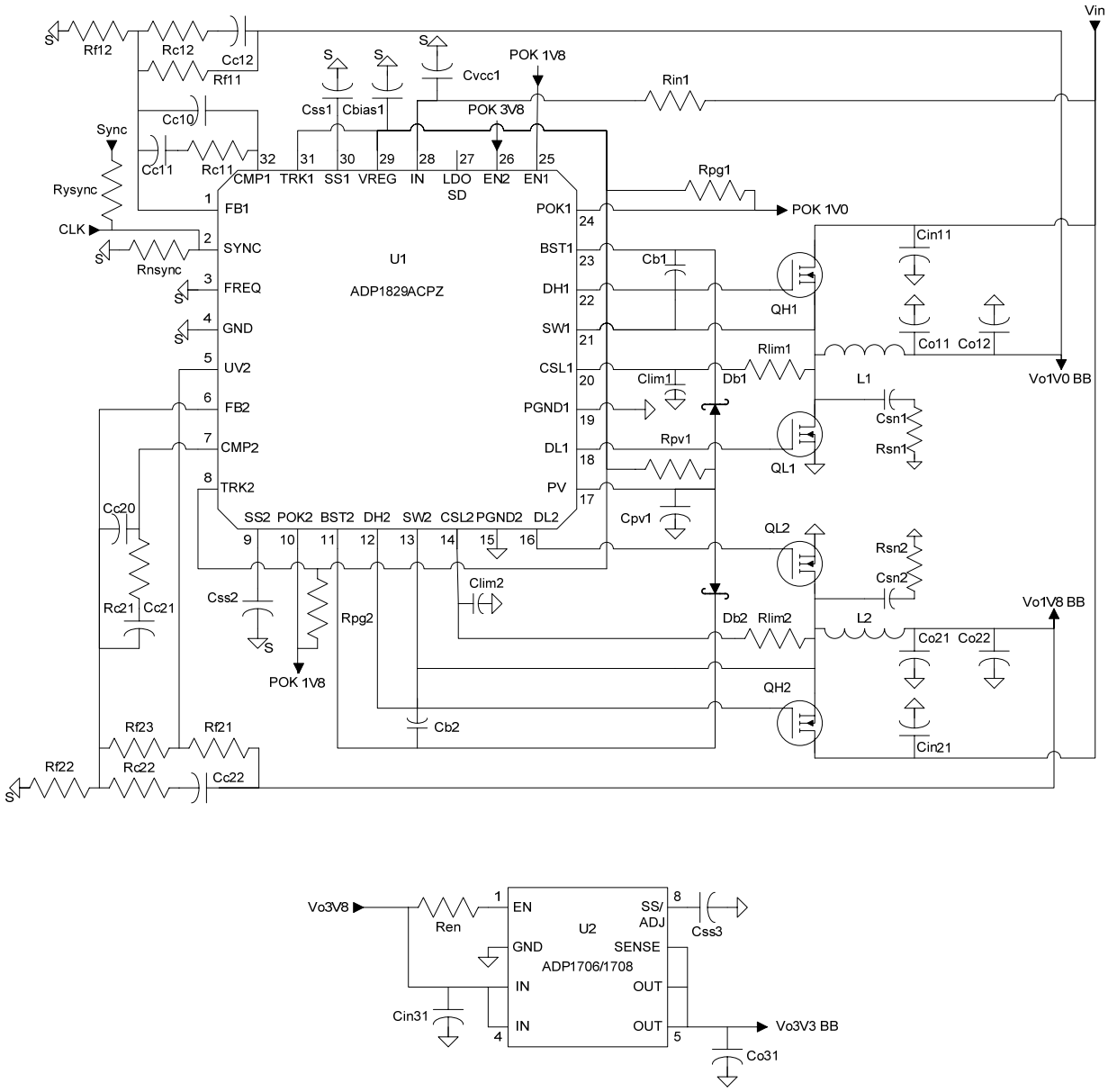


Figure 4. Calculated efficiency of 5.4V output

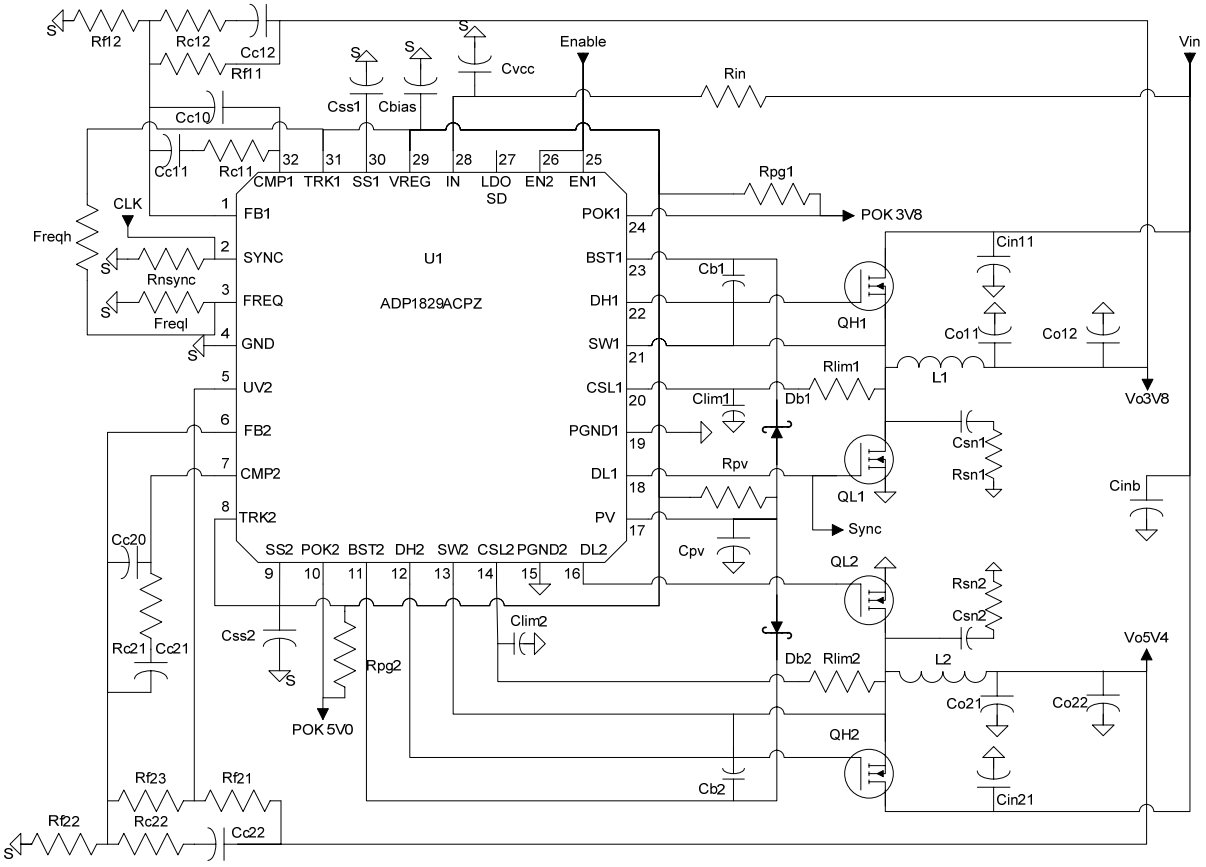
SCHEMATIC

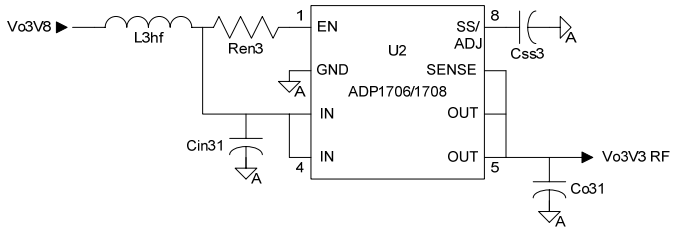
Figure 5. ADP1829 Reference Design Schematic

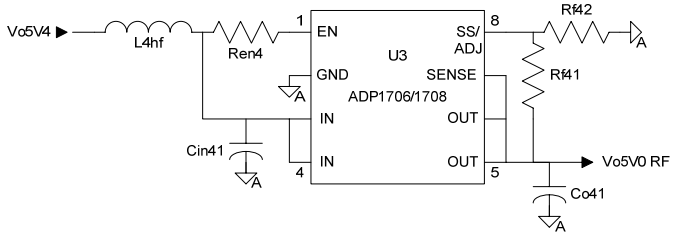
3.3V at 0.7A, 1.8V at 0.8A, 1.0V at 2.8A (BB)



3.3V at 0.7A and 5.0V at 0.5A (RF)







BILL OF MATERIALS

Vout1, Vout2, and Vout3 Bill of Materials

Description	Designator	Quantity	Manufacturer	MFR#
Capacitor Ceramic X7R 1u 0603 16V	Cvcc1, Cbias1, Cpv1	3	Murata	GRM188R71C105KA12D
Capacitor Ceramic X7R 10u 1206 16V	Cin11, Cin21, Co22	3	Murata	GRM31CR71C106KAC7L
Capacitor Ceramic X7R 10n 0603 50V	Css3	1	Vishay	Generic
Capacitor Ceramic X7R 100n 0603 16V	Cb1, Cb2	2	Vishay	Generic
Capacitor Ceramic COG 33p 0603 50V	Clim1, Clim2, Cc20	3	Vishay	Generic
Capacitor Ceramic X7R 2.7n 0603 50V	Cc21	1	Vishay	Generic
Capacitor Ceramic X7R 2.2n 0603 50V	Cc12	1	Vishay	Generic
Capacitor Ceramic X7R 4.7n 0603 50V	Cc22	1	Vishay	Generic
Capacitor Ceramic X7R 15n 0603 16V	Css1, Css2	2	Vishay	Generic
Capacitor Ceramic X7R 4.7u 0805 16V	Cin31, Co31	2	Murata	GRM21BR71C475KA73L
Capacitor Ceramic X7R 22u 1206 6.3V	Co21, Co11, Co12	3	Murata	GRM31CR70J226KE19L
Capacitor Ceramic X7R 1.5n 0603 50V	Cc11	1	Vishay	Generic
Capacitor Ceramic COG 22p 0603 50V	Cc10	1	Vishay	Generic
Diode Schottky 200mA SOD-323 30V	Db1, Db2	2	Diodes inc	BAT54WS
Inductor Ferrite 15uH 7.3mm x 7.3mm	L2	1	Coilcraft	MSS7341-153
Inductor Ferrite 3.8uH 10.2mm x 10mm	L1	1	Coilcraft	MSS1038-382MLC
Single N-Channel MOSFET TSOP-6 30V	QH1, QH2	2	Vishay	Si3456BDV
Single N-Channel MOSFET TSOP-6 30V	QL1, QL2	2	Vishay	Si3424BDV
1A Thick Film 0 Ohm jumper 0603	Rf23, Rnsync	2	Vishay	Generic
5% Thick Film 10 Ohms 0603	Rin1, Rpv1, Rc22	3	Vishay	Generic
1% Thick Film 10.0k 0603	Rpg1, Rpg2, Rf22, Ren	4	Vishay	Generic
1% Thick Film 20.0k 0603	Rf11, Rf21	2	Vishay	Generic
1% Thick Film 30.1k 0603	Rf12	1	Vishay	Generic
1% Thick Film 22.1 Ohms 0603	Rc12	1	Vishay	Generic
1% Thick Film 4.32k 0603	Rlim1	1	Vishay	Generic
1% Thick Film 1.78k 0603	Rlim2	1	Vishay	Generic
1% Thick Film 40.2k 0603	Rc11	1	Vishay	Generic
1% Thick Film 36.5k 0603	Rc21	1	Vishay	Generic
2 chan 300k to 600k PWM LFCSP-32	U1	1	Analog Devices	ADP1829ACPZ
1A 3.3V Linear Reg SOIC-8 w/SS	U2	1	Analog Devices	ADP1706ARDZ-3.3-R7

Vout3 and Vout4 Bill of Materials

Description	Designator	Quantity	Manufacturer	MFR#
Capacitor Ceramic X7R 2.2n 0603 50V	Cc11, Cc21	2	Vishay	Generic
Capacitor Ceramic COG 150p 0603 50V	Cc10, Cc20	2	Vishay	Generic
Capacitor Ceramic X7R 1.5n 0603 50V	Cc12, Cc22	2	Vishay	Generic
Capacitor Ceramic X7R 1u 0603 16V	Cvcc, Cbias, Cpv	3	Murata	GRM188R71C105KA12D
Capacitor Ceramic X7R 47n 0603 16V	Css1, Css2	2	Vishay	Generic
Capacitor Ceramic X7R 10n 0603 50V	Css3	1	Vishay	Generic
Capacitor Ceramic X7R 10u 1206 16V	Cin11, Co11, Cin21, Co21	4	Murata	GRM31CR71C106KAC7L
Capacitor POSCAP 105C 150u 7343 16V	Cinb	1	Sanyo	16TQC68M
2nd source KO Cap 105C 150u 7343 16V	(Cinb)	(1)	Kemet	T520D686M016A(1)E050
Capacitor POSCAP 105C 150u 7343 6.3V	Co12, Co22	2	Sanyo	6TPB150M
2nd source KO Cap 105C 150u 7343 6.3V	(Co12), (Co22)	(2)	Kemet	T520D157M006A(1)E055
Capacitor Ceramic X7R 100n 0603 16V	Cb1, Cb2	2	Vishay	Generic
Capacitor Ceramic COG 33p 0603 50V	Clim1, Clim2	2	Vishay	Generic
Capacitor Ceramic X7R 22u 1206 6.3V	Cin31, Cin41	2	Murata	GRM31CR70J226KE19L
Capacitor Ceramic X7R 4.7u 0805 16V	Co31, Co41	2	Murata	GRM21BR71C475KA73L
Diode Schottky 200mA SOD-323 30V	Db1, Db2	2	Diodes inc	BAT54WS
Inductor Ferrite 22uH 10.2mm x 10mm	L1	1	Coilcraft	MSS1038-223MLC
Inductor Ferrite 33uH 7.3mm x 7.3mm	L2	1	Coilcraft	MSS7341-333MLD
Inductor HF Ferrite 500Ohms 1206 2.0A	L3hf, L4hf	2	Taiyo Yuden	FBMH3216HM501NT
Single N-Channel MOSFET TSOP-6 30V	QH1, QH2	2	Vishay	Si3456BDV
Single N-Channel MOSFET TSOP-6 30V	QL1, QL2	2	Vishay	Si3424BDV
1A Thick Film 0 Ohm jumper 0603	Rf23, Freql, Rnsync	3	Vishay	Generic
5% Thick Film 10 Ohms 0603	Rin, Rpv	2	Vishay	Generic
1% Thick Film 10.0k 0603	Rpg1, Rpg2, Ren3, Ren4	4	Vishay	Generic
1% Thick Film 20.0k 0603	Rf11, Rf21	2	Vishay	Generic
1% Thick Film 1.50k 0603	Rc12, Rc22	2	Vishay	Generic
1% Thick Film 2.49k 0603	Rf22	1	Vishay	Generic
1% Thick Film 2.26k 0603	Rlim1	1	Vishay	Generic
1% Thick Film 1.07k 0603	Rlim2	1	Vishay	Generic
1% Thick Film 3.74k 0603	Rf12	1	Vishay	Generic
1% Thick Film 40.2k 0603	Rc11, Rc21	2	Vishay	Generic
1% Thick Film 147k 0603	Rf41	1	Vishay	Generic
1% Thick Film 28.0k 0603	Rf42	1	Vishay	Generic
2 chan 300k to 600k PWM LFCSP-32	U1	1	Analog Devices	ADP1829ACPZ
1A 3.3V Linear Reg SOIC-8 w/SS	U2	1	Analog Devices	ADP1706ARDZ-3.3-R7
1A Adjustable Linear Reg SOIC-8	U3	1	Analog Devices	ADP1708ARDZ-R7

NOTES

Reference designators shown on the schematic but not listed on the Bill of Materials are place holders for possible design adjustments (snubbers, additional decoupling capacitors, stuff options) These components should be put in the layout, but not populated unless after testing it is deemed necessary.

If a different number, or different type of output capacitors are used on the switching outputs the loop compensation components may need adjustment.