

LTC4412/LTC4414: Dual Low Loss High Voltage PowerPath Controllers

DESCRIPTION

Demonstration circuit 1635A features the [LTC®4412HVIS6](#) and [LTC4414EMS8](#), low loss PowerPath™ controllers. Each controller is capable of automatically switching between primary and auxiliary power sources for a single output. There are two electrically isolated circuits, one for each IC, for independent evaluation. The LTC4412 circuit is intended for lower current loads, while the LTC4414 circuit is capable of driving larger PMOS devices for higher current loads.

The input supply voltage ranges are from 2.5V to 36V for LTC4412 and 5V to 36V for LTC4414. As initially configured with the default MOSFET, the LTC4412 circuit maximum input voltage is 18V. The LTC4412 and LTC4414 circuit current limits are 2A and 8A respectively.

The primary power paths can be controlled with external logic applied to the CTL pins. PowerPath status can be monitored using the STAT pins. Evaluation of higher current or more complex sourcing systems can be accomplished by installing additional ICs, as well as paralleling the inputs and/or outputs using the *optional* supplied pads. Multiple standard MOSFET package options are also available on each circuit for evaluation convenience.

Design files for this circuit board are available at <http://www.linear.com/demo/DC1635A>

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PERFORMANCE SUMMARY

Specifications are at $T_A = 25^\circ\text{C}$

PARAMETER	CONDITIONS	VALUE	UNIT
Minimum LTC4412 Input Voltage	V_{IN1}	2.5	V
Maximum LTC4412 Input Voltage	V_{IN1} and V_{AUX1}	18	V
LTC4412 Maximum Current	MOSFET Limited	2	A
Minimum LTC4414 Input Voltage	V_{IN2} and V_{AUX2}	5	V
Maximum LTC4414 Input Voltage	V_{IN2} and V_{AUX2}	36	V
LTC4414 Maximum Current	MOSFET Limited	8	A

QUICK START PROCEDURE

Demonstration circuit 1635A is easy to set up to evaluate the performance of LTC4412 and LTC4414. Refer to Figure 1 for proper measurement equipment setup of both circuits and follow the procedures below.

LTC4412 Circuit

1. With all power off, connect auxiliary (V_{AUX1}) and primary (V_{IN1}) power supplies capable of 2A each, the system load and meters as shown in Figure 1.
2. Preset the system load to 0A and the input supplies to 0V, 0A current limit.
3. Connect the system load to the output terminals, V_{OUT1} and GND1.
4. Turn on the supplies, setting the current limit up to 2A. Adjust the voltages to the desired value, up to 18V. The higher voltage of the two supplies should appear at the output.
5. Turn the load on and adjust as necessary.
6. Adjust the supplies and observe how the output switches over to follow the higher voltage of the two sources.

LTC4414 Circuit

1. With all power off, connect auxiliary (V_{AUX2}) and primary (V_{IN2}) power supplies capable of 8A each, the system load, and meters as shown in Figure 1.
2. Preset the system load to 0A and the input supplies to 0V, 0A current limit.
3. Connect the system load to the output terminals, V_{OUT2} and GND2.
4. Turn on the supplies, setting the current limit up to 8A. Adjust the voltages to the desired value, up to 36V. The higher voltage of the two supplies should appear at the output.
5. Turn the load on and adjust as necessary.
6. Adjust the supplies and observe how the output switches over to follow the higher voltage of the two sources.

Optional

7. For improved current handling, install additional MOSFETs, select from different package footprints, or shunt the two circuits at V_{IN} , V_{OUT} and GND.
8. For source-load back-to-back isolation, remove jumpers JMP1 and JMP2, and/or JMP3 and JMP4, then install additional MOSFETs back-to-back as shown in Figure 2.
9. For external control of the primary source power path, remove the 0 Ω jumper on the CTL1 or CTL2 pin, R2 or R5 respectively. Apply the logic-control signal on CTL1 or CTL2 as necessary.

QUICK START PROCEDURE

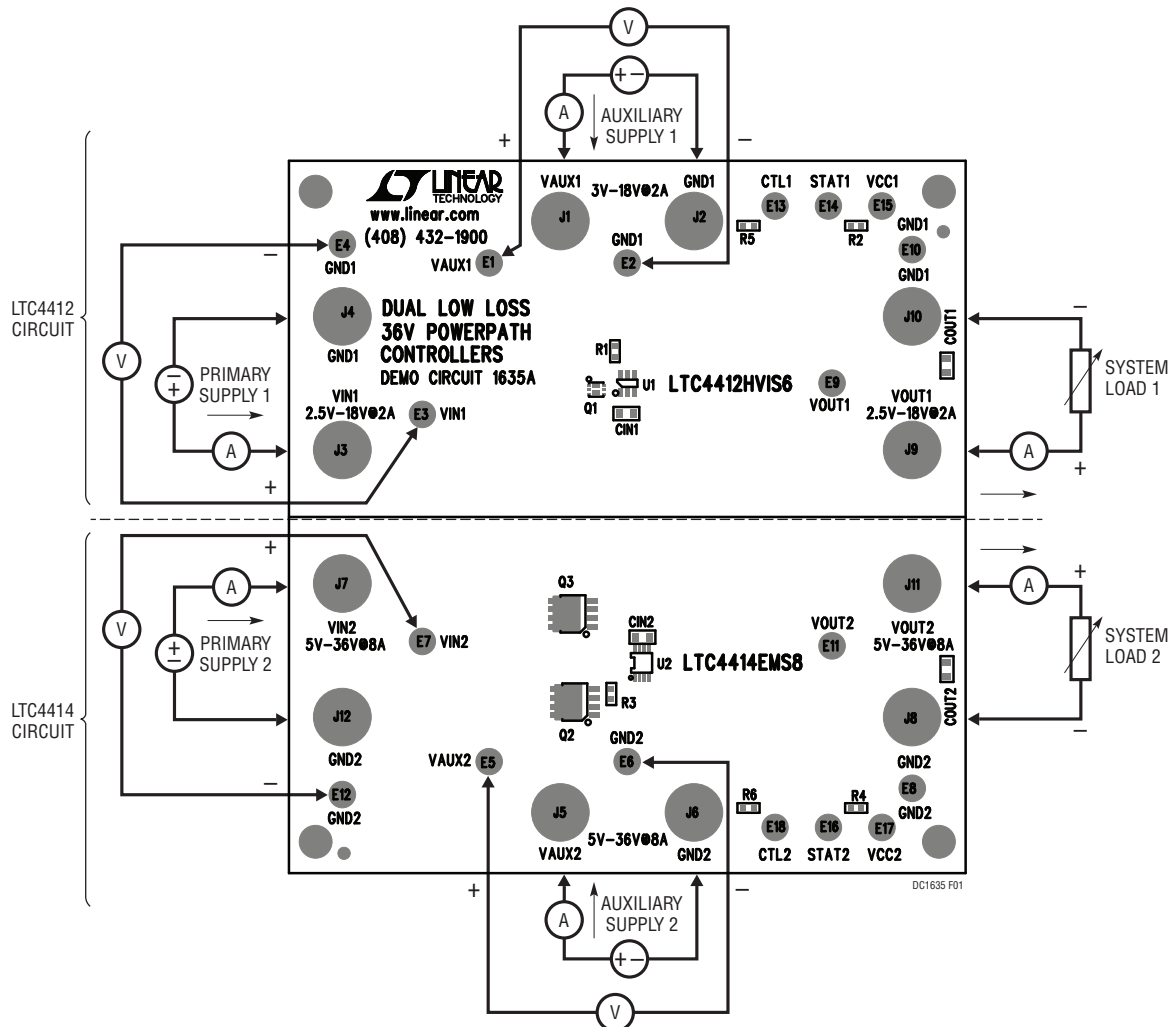


Figure 1. Test Setup of DC1635A

QUICK START PROCEDURE

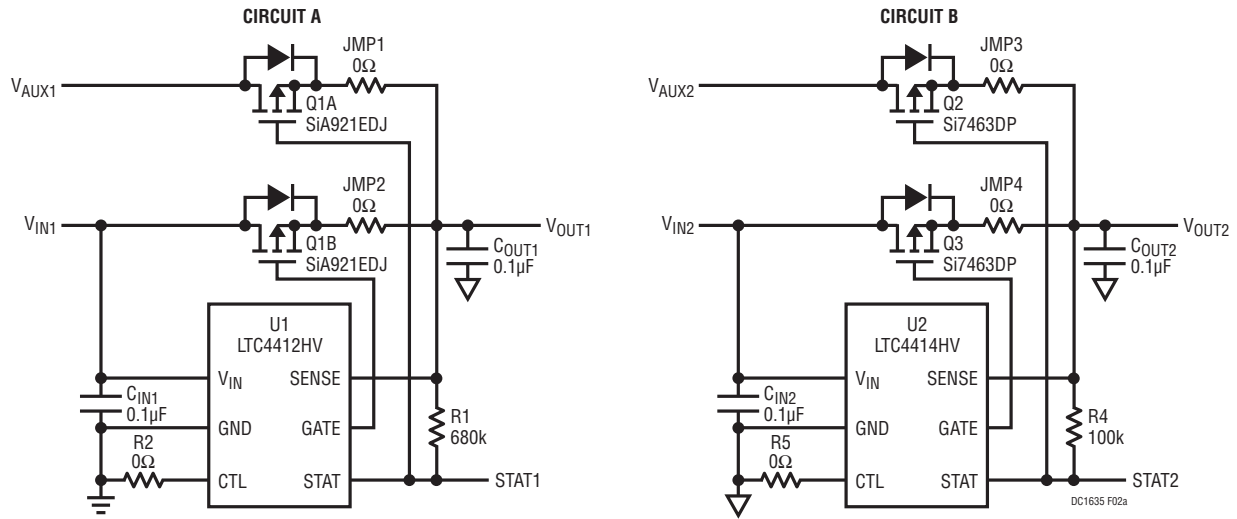


Figure 2a. Standard Configurations with Automatic Switchover Between Sources

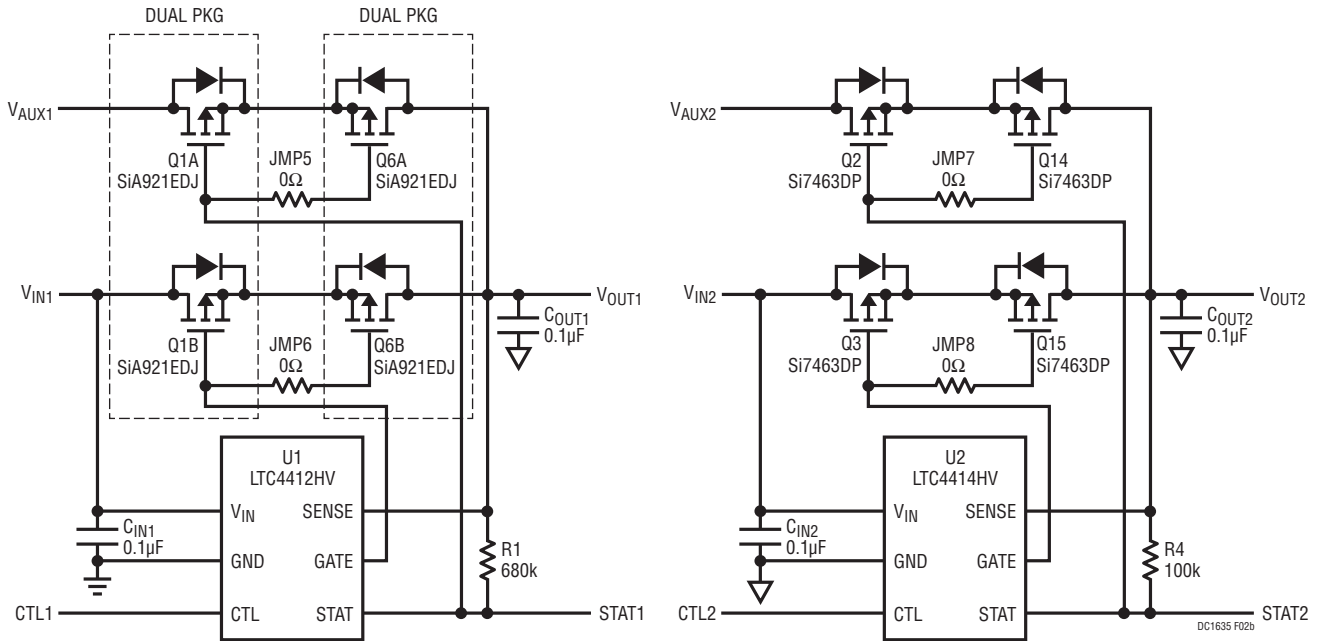


Figure 2b. Optional, Fully-Isolated Configurations with External Logic Control

Diodes shown are body diodes of their respective MOSFETs. Do not install extra diodes or the operation of the power paths may be compromised.

QUICK START PROCEDURE

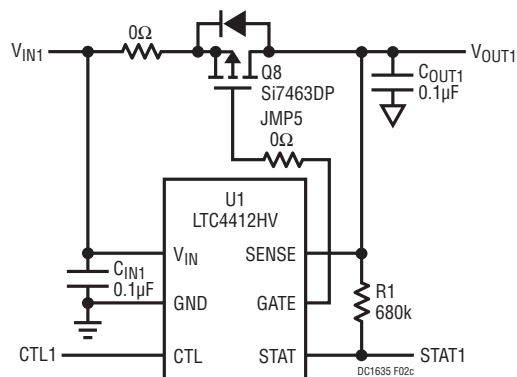


Figure 2c. Optional, High Side Switch with Logic Control and Status Output (Requires 0Ω Jumper Across Drain-Source Pins of Q7)

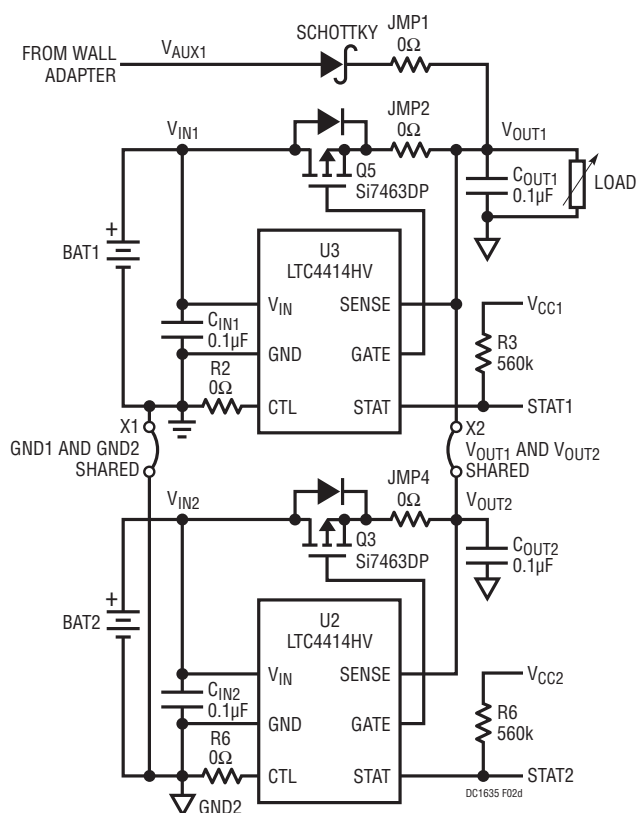


Figure 2d. Optional, High Current Dual Battery Load Sharing with Automatic Switchover and Status Output

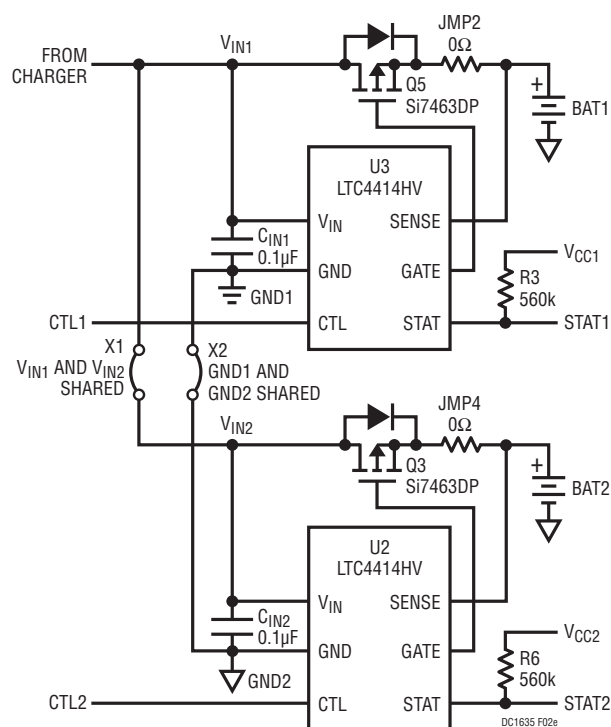


Figure 2e. Optional, Dual Battery Charging with Logic Select and Status Output





DEMO MANUAL DC1635A

SCHEMATIC DIAGRAMS

OPTIONAL CIRCUIT

OPTIONAL CIRCUIT

NOTE FOR ALL CIRCUITS:

THE DEMO BOARD AS SHIPPED SHOWS THE MOST COMMON FUNCTIONS FOR TWO CHANNELS. THE DEMO BOARD IS DESIGNED TO SHOW CASE THE FLEXIBILITY OF THE BOARD. THE BOARD IS DESIGNED TO SHOW CASE THE FLEXIBILITY OF THE BOARD. THE BOARD IS DESIGNED TO SHOW CASE THE FLEXIBILITY OF THE BOARD.

1. NEVER INSTALL U1 (TOP LAYER) AND U3 (BOTTOM LAYER) AT THE SAME TIME. INSTALL ONE OR THE OTHER BUT NOT BOTH.
2. NEVER INSTALL U2 (TOP LAYER) AND U4 (BOTTOM LAYER) AT THE SAME TIME. SAME AS 1.
3. JMP1-4 ARE MEANT FOR SIMPLE DIODE-OR OPERATION. THEY MUST BE REMOVED FOR PROPER BACK-TO-BACK ISOLATION.

THERE ARE MORE GUIDELINES SPECIFICALLY FOR CERTAIN CIRCUITS. PLEASE SEE THE QUICK START GUIDE FOR MORE APPLICATIONS AND INFORMATION.

CUSTOMER NOTICE

LINEAR TECHNOLOGY HAS MADE A BEST EFFORT TO DESIGN A CIRCUIT THAT MEETS CUSTOMER REQUIREMENTS. CUSTOMERS MUST VERIFY PROPER AND RELIABLE OPERATION IN THE ACTUAL APPLICATION. COMPONENT SUBSTITUTION AND PRINTED CIRCUIT BOARD MANUFACTURING VARIATIONS MAY AFFECT CIRCUIT PERFORMANCE OR RELIABILITY. CONTACT LINEAR TECHNOLOGY APPLICATIONS ENGINEERING FOR ASSISTANCE.

APPROVALS

PCB DES	AK
APP ENG	JOSH Y.

LINEAR TECHNOLOGY

1630 McCarthy Blvd.
Milpitas, CA 95035
Phone: (408) 432-1900 www.linear.com
Fax: (408) 434-0907
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TITLE: SCHEMATIC

DUAL LOW LOSS 36V POWERPATH CONTROLLERS

IC NO. LTC4412HVS6 & LTC4414EMS8

DEMO CIRCUIT 1635A

SIZE: N/A

REV: 2

DATE: Thursday, March 17, 2016

SHEET 3 OF 3

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Required Circuit Components				
1	4	C _{OUT1} , C _{IN1} , C _{OUT2} , C _{IN2}	CAP., X7R, 0.1μF, 50V, 10% 0805	AVX, 08055C104KAT2A
2	1	Q1	DUAL P-CHAN., 20V/4.5A	VISHAY, SiA921EDJ-T1-GE3
3	2	Q2, Q3	MOSFET P-CHAN., 40V/10A	VISHAY, Si7463DP-T1-GE3
4	1	R1	RES., CHIP, 690k, 1%, 0603	VISHAY, CRCW0603690KFKEA
5	1	R3	RES., CHIP, 100k, 1%, 0603	VISHAY, CRCW0603100KFKEA
6	2	R5, R6	RES., CHIP, 0Ω, 0603	VISHAY, CRCW06030000Z0EA
7	1	U1	I.C., LTC4412HVIS6	LINEAR TECH., LTC4412HVIS6#PBF
8	1	U2	I.C., LTC4414EMS8	LINEAR TECH., LTC4414EMS8#PBF
Additional Circuit Components				
1	0	Q6, Q12, Q13	OPT	VISHAY, SiA921EDJ-T1-GE3
2	0	Q4, Q5, Q7, Q8, Q14, Q15	OPT	VISHAY, Si7463DP-T1-GE3
3	0	Q16, Q17, Q18, Q19	OPT	VISHAY, Si7905DN-T1-E3
4	4	JMP1, JMP2, JMP3, JMP4	JUMPER, 1206	TEPRO, RN6087
5	2	R2, R4	RES., CHIP, 560k, 1%, 0603	VISHAY, CRCW0603560KFKEA
6	0	JMP5, JMP6, JMP7, JMP8	RES., 0603 OPT	
7	0	U3	I.C., LTC4414EMS8 OPT	LINEAR TECH., LTC4414EMS8#PBF
8	0	U4	I.C., LTC4412HVIS6 OPT	LINEAR TECH., LTC4412HVIS6#PBF
Hardware-For Demo Board Only				
1	18	E1, E2, E3, E4, E5, E6, E7, E8, E9, E10	TEST POINT, TURRET, 0.095"	MILL-MAX, 2501-2-00-80-00-00-07-0
		E11, E12, E13, E14, E15, E16, E17, E18	TEST POINT, TURRET, 0.095"	MILL-MAX, 2501-2-00-80-00-00-07-0
2	12	J1, J2, J3, J4, J5, J6, J7, J8, J10, J11, J12	BANANA JACK	KEYSTONE, 575-4
3	4	(STAND OFF)	STAND OFF, NYLON 0.25"	KEYSTONE, 8831 (SNAP ON)

DEMO MANUAL DC1635A

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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

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