

QUICK START GUIDE FOR DEMONSTRATION CIRCUIT DC1059A

DUAL "IDEAL DIODE" POWERPATH™ DEMOBOARD

LTC4416

DESCRIPTION

WARNING: READ THIS MANUAL FIRST BEFORE OPERATING THE DEMOBOARD. THERE ARE ILLEGAL POWER CONFIGURATIONS OR VOLTAGE LEVELS THAT CAN POTENTIALLY DAMAGE THE DEMOBOARD.

From the factory:

1) MINIMUM INPUT VOLTAGE: The installed P-MOSFETS, SI7463DP have a minimum rated 4.5Vgs-on. Operating any FET below it minimum Vgs-on rating at any time can result in destruction of the FET. The FETs are on the bottom of the board.

2) CONFIGURATION: Only the FET's blocking reverse current flow, Q5 and Q7, are operational. If one activates the Off feature, which ever FET is turned off, will still pass forward current to the load via the FET's internal parasitic diode. If the load current is high enough and passes through the FET that is turned off, the FET may burn up.

Demonstration circuit DC1059A is a dual PowerPath™ circuit featuring the LTC4416. With the PFETs installed at the factory, the operational input voltage is 5 to 36V. The maximum charge current is 7A. The factory configuration features the standard LTC4416 setup for Power Diode-Or and load sharing of two input power supplies assuming they both have identical ratings. It can be quickly converted to other configurations

Although the board works as is, to get the most performance out of the Demoboard, one FIRST needs to determine what correct configuration you need for target applications. Some configurations may require user modification to the board prior to testing. Whatever configuration you chose, you must understand the limits of that configuration. Refer to the schematic for more information.

Design files for this circuit board are available. Call the LTC factory.

Table 1. Demoboard Performance Summary

PARAMETER	CONDITION/NOTES	VALUE
Maximum Input Voltage	Derating relative to Absolute max of 40V.	+36V
Recommended Minimum Input Voltage	Limited by Vgs rating of the installed PFET.	4.5V, 5V recommended.
Reverse Input Stand-Off Voltage		-14V Maximum.
Maximum Current	Limited by PFET Rds versus Pd rating of the Demoboard. Shutdown Configuration.	7A
Id rating of installed SI7463DP PFET (Max)	See PFET datasheet for most up to date information.	15A @ -4.5Vgs 18.6A @ -10Vgs
Typical Forward Voltage Regulation (Vfd)	See LTC4416 for complete information.	25mV (not guaranteed)
Rds-on of installed SI7463DP PFET (Max)	See PFET datasheet for most up to date information.	0.014 Ohms @ -4.5Vgs, 0.0092 Ohms @ -10Vgs
Estimated actual Rds-on with Vin > 10V.	Using SI7463DP PFET. Typical data.	0.008 Ohms @ -8Vgs
Current level where Rds x I load > Vfd, 1 FET	Using 25mV Vfd. 1 FET always on configuration.	3A
Current level where Rds x I load > Vfd, 2 FET	Using 25mV Vfd. 2 FET shutdown configuration.	1.5A

QUICK START GUIDE FOR DEMONSTRATION CIRCUIT DC1059A

DUAL "IDEAL DIODE" POWERPATH™ DEMOBOARD

Changing the Default Configuration:

The demo board has been configured as a dual Ideal-diode Power-Or Circuit with no shutoff capability by default. However a jumper, JMP5/6, is provided for each path such that if removed, will enable a second installed FET to become operational and allow shutdown capability for that path. Only in this mode can the On/Off control jumper be used safely under all load conditions.

FET Package Options:

The installed FETs are located on the bottom side of the Demoboard. The PCB footprint is compatible with standard SO-8 and Power SO-8 packages. Unstuffed PCB footprints supporting DD or TO-263 package are located on the top. This was done to permit airflow and/or heat-sinking as required for these bigger FETs. If you install the TO-263 part on the top, you should remove any and all FETs on the bottom. Only have the number of FETs you really need installed.

FET Types Supported:

Any FET you chose must be a P-Channel MOSFET. There are no charge pumps to support N-Channel MOSFETs. See the datasheet for more information about FETs.

Optimizing Factory Default Configuration:

If you plan to never shut off a given power path, you should remove Q6 or Q8 in that path and leave JMP6 or JMP 5 installed respectively. If you never plan to shutoff any path, remove both Q6 and Q8 and leave both JMP5/6 installed. Removing the unused FET will speed up the response of the path in terms of it implementing the Idea diode function. See speed optimization section.

PowerPath Shutdown Configuration:

If you wish to enable shutdown of one or both paths, simply remove JMP5/6 as needed to activate the second FETs.

Speed Optimization:

Adding or leaving any un-necessary FETs installed will slow down the response time to less than what you will get in the real application. The gate drive is in the form of a current sink/source. Speed will be a function of the total Qg of all the FETs seen by the gate driver. Higher Qg gives slower response. Likewise lower Qg will result in faster response. For a given stated of FET technology, higher Qg FETs offer lower Rds-on while lower Qg FETs have higher Rds-on. Thus there is tradeoff between speed and Rds-on. If the voltages being managed by the LTC4416 are fast in coming or going, speed may be more important than Rds-on.

Installing a LTC4416-1:

This board will support an LTC4416-1 if you replace the supplied LTC4416. The LTC4416-1 offers a Fast-Off feature that is often more suitable when the two supplies rails are NOT going to share the load current.

Gate drive:

The LTC4416 does not drive the Vgs gate voltage logically. The Vgs voltage on the gate is driven linearly and as such the voltage will vary in value depending on the load current and the Rds-on range of the FETs involved.

Status Indicators:

A local onboard power supply generates a voltage suitable to drive the LED to show ON or OFF status as seen by the Enable pins. They do not show if a given path is conducting current or not. This LED circuit does draw some current from the external supplies. If you wish to measure the LTC4416 Iq current, you can modify the circuit as needed to kill the supply.

Manual ON-OFF control:

JP1 and JP2 should only be used IF and only IF you change the Demoboard configuration to support Shutdown for that corresponding PowerPath. If you wish to setup for comparator control, remove the jumper completely for that path.

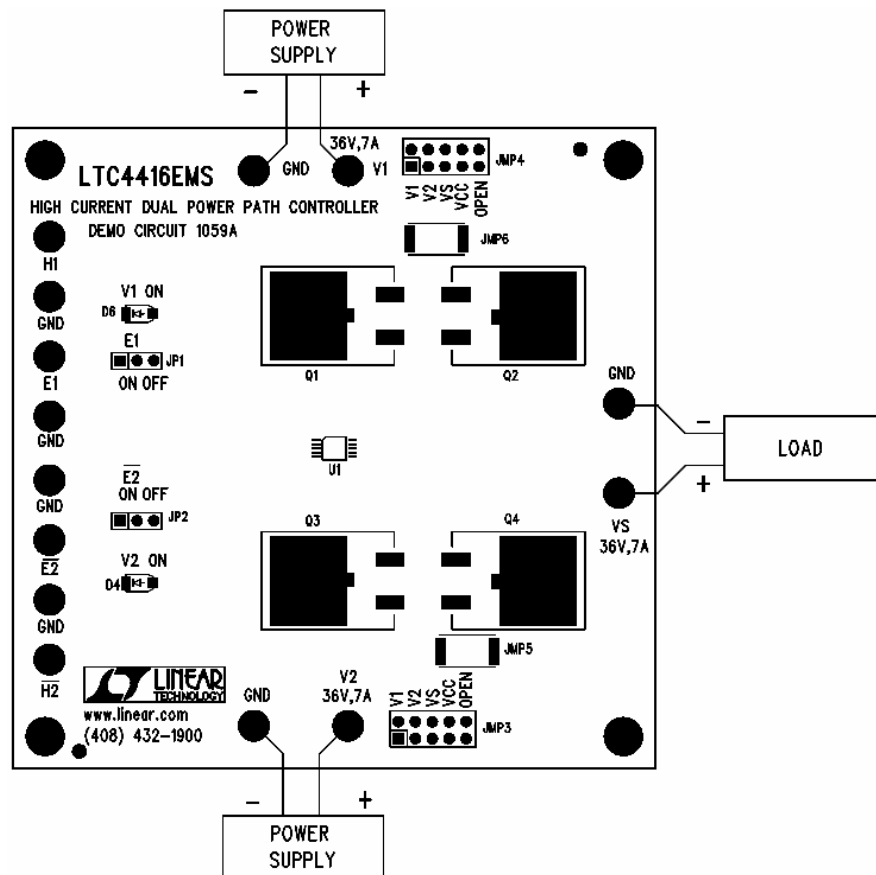
Comparator Input Control:

The LTC4416 has precision comparator input threshold's which allow one to set up custom trip points based on monitoring external voltages forcing the LTC4416 into various modes. These modes can only be used if you setup the board configuration to support shutdown. In you going to use the comparator function, you must first remove the Manual On-Off jumper for that path. These trip points are supported by R1, R2, R5 and JMP4 for the #1 path. R3, R4, R6 and JMP3 for the #2 path. If necessary, you may have to remove D7 or D5 for correct hysteresis operation giving up status indication. Consult the datasheet for more information about setting trip levels.

QUICK START PROCEDURE

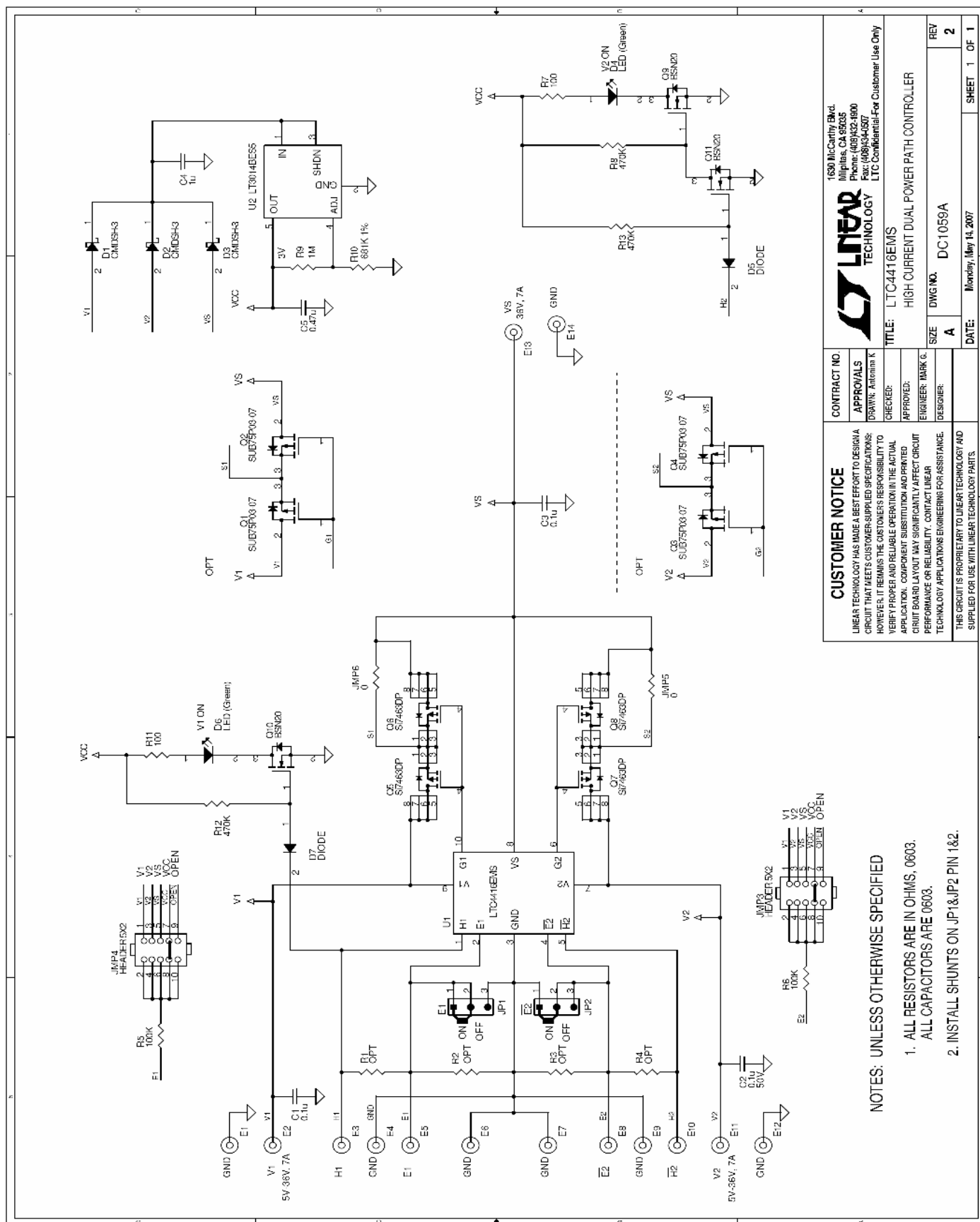
1. Connect two identical power supplies to V1 and V2 inputs. The input voltage must be within the range shown for the Demoboard Performance Table. Suitable current to support the load.
2. Connect a suitable load to the Vs output terminals. The load should not exceed the maximum current rating of the Demoboard. Set the load to 0 amps.
3. Turn on the input power supplies.
4. Adjust the load as required.

Figure1: Proper Measurement Equipment Setup



QUICK START GUIDE FOR DEMONSTRATION CIRCUIT DC1059A

DUAL "IDEAL DIODE" POWERPATH™ DEMOBOARD



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

DRAWN: Antonia K

CHECKED:

APPROVED:

ENGINEER: MARK G.

DESIGNER:



1630 McCarthy Blvd.
Milpitas, CA 95035
Phone: (408) 321-1900
Fax: (408) 321-5007

TITLE: LTC4416EMS

HIGH CURRENT DUAL POWER PATH CONTROLLER

SIZE A

DWG NO. DC1059A

REV 2

NOTES: UNLESS OTHERWISE SPECIFIED

1. ALL RESISTORS ARE IN OHMS, 0603.
2. INSTALL SHUNTS ON JP1 & JP2 PIN 1 & 2.