

## 28V, 2A Ideal Diode & Switch Load

### General Description

The EVAL-LT4423-AZ evaluation circuit showcases the LT4423, an ideal diode with integrated back to back P-channel MOSFETs and a load switch designed to minimize power dissipation by regulating a 15mV forward voltage when enabled. Its fast OUT to IN reverse bias detection minimizes reverse current to prevent unwanted charging of the input source. The integrated thermal detection offers additional protection against over thermal conditions by disabling the power path.

The board features two independent LT4423 ideal diodes and load switches that share a common ground and operate over a 1.9V to 28V range.

Use the  $\overline{\text{SHDN}}$  input to turn on and off power to the load. In shutdown mode, the LT4423 exhibits less than 500nA (typical) quiescent current to extend battery life.

**Design files for this circuit board are available.**

### Performance Summary ( $T_A = 25^\circ\text{C}$ )

| PARAMETER               | SYMBOL                             | CONDITIONS                                       | MIN | TYP | MAX | UNITS |
|-------------------------|------------------------------------|--------------------------------------------------|-----|-----|-----|-------|
| Input Voltage           | $V_{\text{IN}}$                    |                                                  | 1.9 |     | 28  | V     |
| Input to Output Voltage | $ V_{\text{IN}} - V_{\text{OUT}} $ |                                                  |     |     | 30  | V     |
| Output Voltage          | $V_{\text{OUT}}$                   |                                                  | -30 |     | +30 | V     |
| Output Current          | $I_{\text{OUT}}$                   | $V_{\text{IN}} = 1.9\text{V}$                    |     |     | 1.2 | A     |
|                         |                                    | $V_{\text{IN}} = 2\text{V}$                      |     |     | 1.4 | A     |
|                         |                                    | $2.4\text{V} \leq V_{\text{IN}} \leq 28\text{V}$ |     |     | 2   | A     |

## Quick Start Procedure

The EVAL-LT4423-AZ evaluation circuit features two independent LT4423s that share a common ground. Each LT4423 is equipped with integrated P-channel MOSFETs in an ideal diode and switch load configuration. A diode-or arrangement is used to evaluate the LT4423's performance. See Figure 1 and use the following procedure for proper measurement equipment setup:

1. With the power off, set jumpers JP1 and JP2 to ON. Connect the input power supply to the board through the VIN and GND terminals of both channel A and B. Connect the load to the VOUTA and GND terminal. Tie VOUTB to VOUTA.
2. Set the power supply of  $V_{INA} = 12V$ ,  $V_{INB} = 5V$ , and turn ON.
3. Observe  $V_{OUT} = 12V$ .
4. Slowly increase  $V_{INB}$ 's voltage to 24V.
  - a. When  $V_{INB}$  goes above 12V, observe  $V_{OUT}$  rises with  $V_{INB}$ .
  - b. When  $V_{INB} = 24V$ ,  $V_{OUT} = 24V$ .
5. Slowly decrease  $V_{INB}$  to 5V.
  - c. Observe  $V_{OUT}$  follows  $V_{INB}$  until  $V_{INB}$  reaches 12V.
  - d. When  $V_{INB}$  goes below 12V,  $V_{OUT} = 12V$ .
6. Set JP1 to OFF, observe  $V_{OUT} = 5V$ .
7. Set JP2 to OFF, observe  $V_{OUT} = 0V$ .

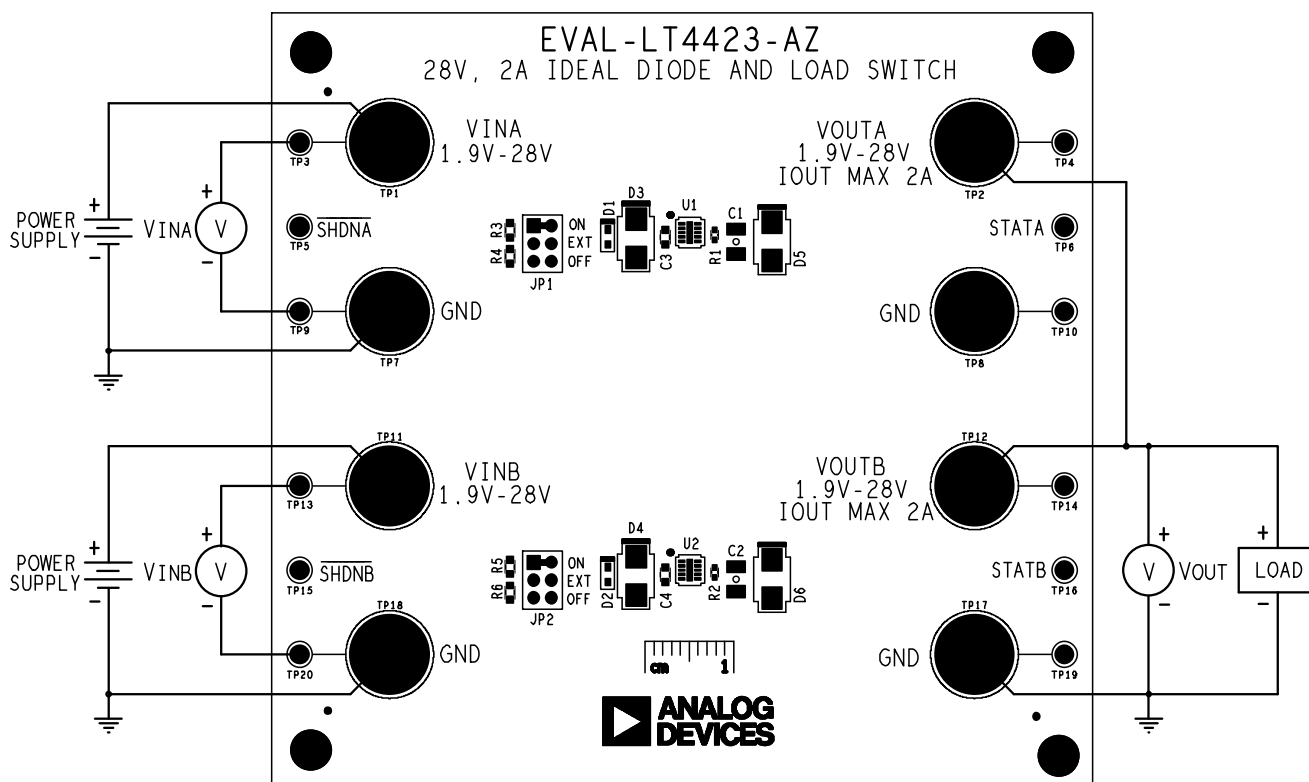


Figure 1. EVAL-LT4423-AZ Board Connection in Diode-Or Configuration

### ON/OFF Control

The LT4423 can be turned on and off by placing the  $\overline{\text{SHDN}}$  jumper in the ON or OFF position. In the OFF position, the  $\overline{\text{SHDN}}$  pin is connected to GND, disabling the power path. In shutdown, the quiescent current consumption of the LT4423 is reduced to  $\approx 500\text{nA}$  (typical). In the ON position,  $\overline{\text{SHDN}}$  is shorted to VIN to enable the LT4423 when the input voltage supply is within operational range.

In the EXT position, the  $\overline{\text{SHDN}}$  pin is connected through a resistive divider from VIN or a voltage applied by an external source on the  $\overline{\text{SHDN}}$  turret. By adding a resistive divider from VIN to GND, the EVAL-LT4423-AZ can be programmed to enabled/disabled at a specified VIN voltage.

### Thermal Shutoff

In heavy load cases, the temperature of the LT4423 can reach over temperature conditions. The LT4423's integrated thermal shutdown disables its power path when it exceeds  $160^{\circ}\text{C}$  to protect the part. When the LT4423's temperature lowers to  $145^{\circ}\text{C}$ , the thermal shutdown enables the power path again.

In cases where the load is heavy during startup, the LT4423 performs the thermal shutdown to rapidly disable and enable the power path until OUT follows IN.

### STATUS Detection

STATUS is an open-drain output intended to indicate power-path conditions. STATUS is designed for connection to a power supply through pull-up resistors. The open-drain STATUS output pulls low when the LT4423 is in shutdown, reverse bias, or under thermal protection. Note that the STATUS function is optional and can easily be removed for simplicity by leaving STATUS open.

## Performance Curves

( $T_A = 25^\circ\text{C}$ , unless otherwise noted.)

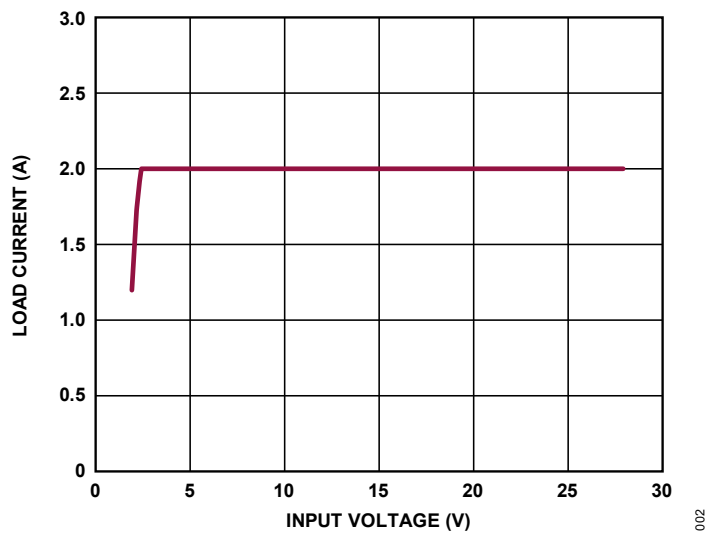


Figure 2. Maximum Output Current vs. Input Voltage

## Bill of Materials

| ITEM                                          | QTY | DESIGNATOR                                 | DESCRIPTION                                                                   | MANUFACTURER PART NUMBER          |
|-----------------------------------------------|-----|--------------------------------------------|-------------------------------------------------------------------------------|-----------------------------------|
| <b>REQUIRED CIRCUIT COMPONENTS</b>            |     |                                            |                                                                               |                                   |
| 1                                             | 2   | C1, C2                                     | CAP CER 10uF 50V 10% X7R 1206                                                 | SAMSUNG, CL31B106KBHNNNE          |
| 2                                             | 2   | C3, C4                                     | CAP CER 0.1uF 50V 10% X7R 0603                                                | AVX, 06035C104KAT2A               |
| 3                                             | 2   | R1, R2                                     | RES SMD 100K Ohm 1% 1/10W 0402 AEC-Q200 100K R1                               | PANASONIC, ERJ-2RK1003X           |
| 4                                             | 2   | U1, U2                                     | IC-ADI 28V, IDEAL DIODE AND LOAD                                              | ANALOG DEVICES, LT4423AV#TRPBF    |
| <b>OPTIONAL CIRCUIT COMPONENTS</b>            |     |                                            |                                                                               |                                   |
| 1                                             | 2   | D1, D2                                     | IO SCHOTTKY 30V 1A 2LD SOD-523                                                | NEXPERIA, PMEG3010EB, 115         |
| 2                                             | 4   | D3–D6                                      | DIO TVS UNI-DIRECTIONAL 28V 600W DO-214AA                                     | DIODES INCORPORATED, SMBJ28A-13-F |
| 3                                             | 4   | R3–R6                                      | DO NOT INSTALL (R0603)                                                        | TBD0603                           |
| <b>HARDWARE — FOR EVALUATION CIRCUIT ONLY</b> |     |                                            |                                                                               |                                   |
| 1                                             | 2   |                                            | SHUNT, 2POS, 2MM PITCH, BLACK                                                 | SAMTEC INC., 2SN-BK-G             |
| 2                                             | 4   |                                            | STANDOFF, BRD SPT SNAP FIT 15.9MM LENGTH                                      | KEYSTONE, 8834                    |
| 3                                             | 2   | JP1, JP2                                   | CONN-PCB 6POS UNSHROUDED HEADER VERT 2MM PITCH                                | SAMTEC INC., TMM-103-02-L-D       |
| 4                                             | 8   | TP1, TP2, TP7, TP8, TP11, TP12, TP17, TP18 | CONN-PCB, BANANA JACK, FEMALE, NON-INSULATED, THT, SWAGE, 0.218 INCHES LENGTH | KEYSTONE ELECTRONICS, 575-4       |
| 5                                             | 12  | TP3–TP6, TP9, TP10, TP13–TP16, TP19        | CONN-PCB SOLDER TERMINAL TURRETS FOR CLIP LEADS                               | MILL-MAX, 2308-2-00-80-00-00-07-0 |

## Schematic

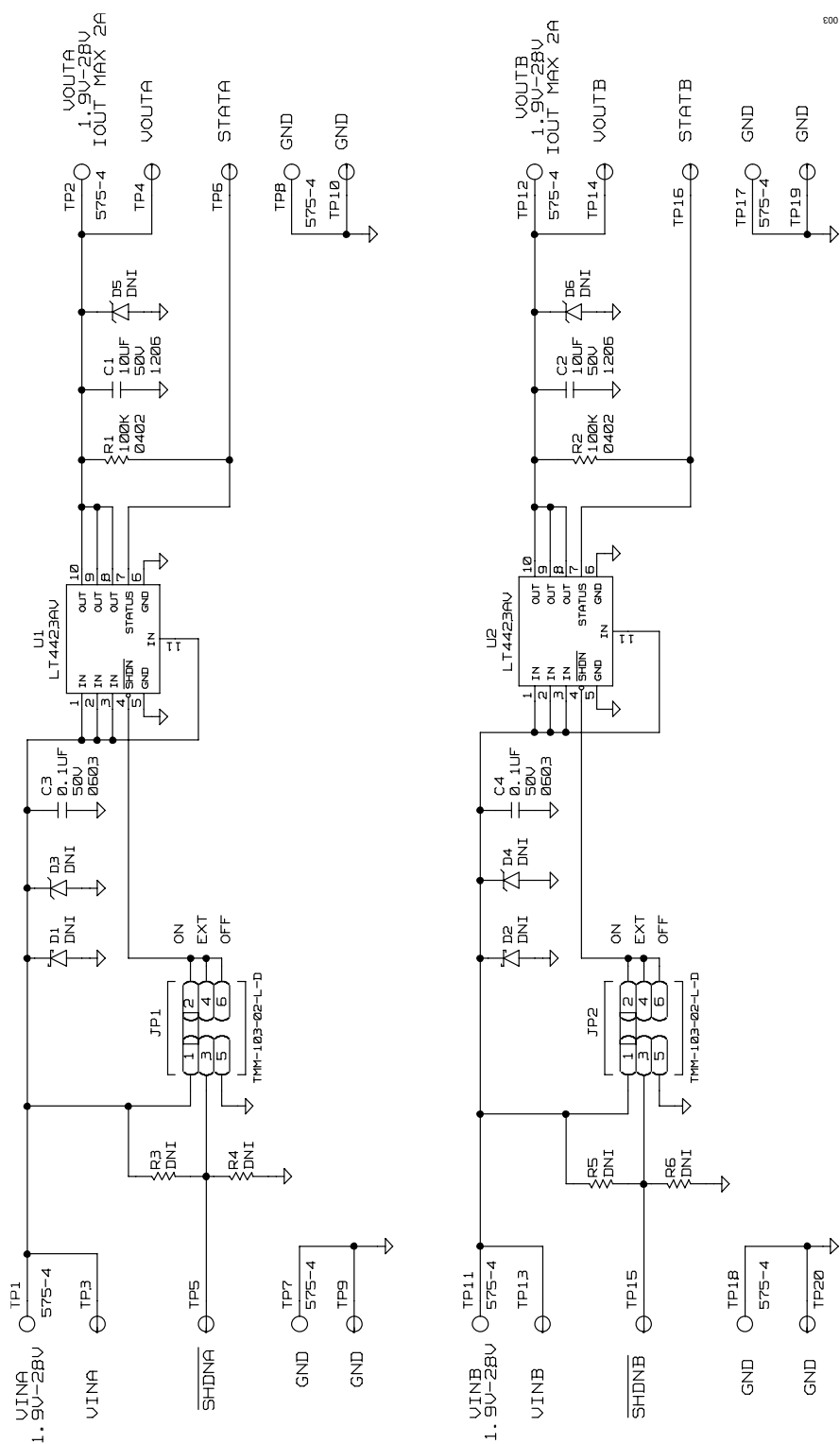


Figure 3. EVAL-LT4423-AZ Schematic

## Revision History

| REVISION<br>NUMBER | REVISION<br>DATE | DESCRIPTION     | PAGES<br>CHANGED |
|--------------------|------------------|-----------------|------------------|
| 0                  | 9/24             | Initial release | —                |

## Notes

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