

High-Efficiency Fully Integrated 17V/8A Switched Capacitor Converter

General Description

Evaluation circuit [EVAL-LT7826-AZ](#) is an open-loop switched capacitor (inductor-less) DC/DC converter. It can operate as a 2:1 voltage divider when input voltage is connected to VHIGH, or as a 1:2 voltage doubler when input voltage is connected to VLOW. The EVAL-LT7826-AZ operates from a VHIGH range of 3.4V to 17V and a VLOW range of 1.7V to 8.5V. LT7826's switching frequency is fixed to 500kHz. As a voltage divider, it can supply up to 8A of load current.

EVAL-LT7826-AZ features [LT7826](#): a fully integrated monolithic switched capacitor 2:1 converter configurable as a voltage divider, doubler, or inverter. The LT7826 features integrated bootstrap diodes and a low quiescent current of 4 μ A at shutdown. It provides a compact, cost-effective solution for battery system applications, portable consumer electronics, and industrial applications.

EVAL-LT7826-AZ allows users to program the input voltage enable and undervoltage lockout (UVLO) thresholds via RUN pin resistor dividers. LT7826 also offers protection functions. At overcurrent conditions or IC

overtemperature conditions, the FAULT pin is pulled low, and switching is stopped.

The EVAL-LT7826-AZ requires no load or light load start-up. After the input voltage is applied to the board, LT7826 enters pre-balance mode if the RUN pin and MODE pin are above their thresholds, and INTVCC is above the UVLO threshold. During pre-balance mode, capacitors are charged with reduced current and switching frequency. Full load current can be applied after pre-balance is finished and an output voltage is established.

The EVAL-LT7826-AZ can be paralleled with other EVAL-LT7826-AZ circuit boards. Switching synchronization is available through the MODE turret for frequency tuning and interleaving operation. Refer to the *Typical Applications* section of the *LT7826 datasheet* for an example of paralleling two LT7826 devices for interleaving operation.

The LT7826 is available in a 3mm x 3mm LFCSP package. The LT7826 datasheet gives a complete description of the part's operation and application information. The LT7826 datasheet must be read in conjunction with this user guide to use the evaluation circuit EVAL-LT7826-AZ properly.

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

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
VHIGH Voltage Range	V_{HIGH}			3.4		17	V
VLOW Voltage Range	V_{LOW}			1.7		8.5	V
Output Current	I_{LOW}				8		A
VHIGH Turn-On Rising	$V_{\text{HIGH_EN}(+)}^*$	$R5 = 1\text{M}\Omega, R7 = 37.4\text{k}\Omega$		3.45			V
VHIGH UVLO Falling	$V_{\text{HIGH_UVLO}(-)}^*$	$R5 = 1\text{M}\Omega, R7 = 37.4\text{k}\Omega$		3.15			V
Switching Frequency	f_{SW}			500			kHz
Full-Load Efficiency	η_{FULL}	$I_{\text{LOW}} = 8\text{A}$	$V_{\text{HIGH}} = 7.4\text{V}$	91.37			%
			$V_{\text{HIGH}} = 11.1\text{V}$	94.25			%
			$V_{\text{HIGH}} = 12.6\text{V}$	94.91			%
Peak Efficiency	η_{PEAK}	$I_{\text{LOW}} = 1.5\text{A}$	$V_{\text{HIGH}} = 11.1\text{V}$	98.42			%

Quick Start Procedure

The EVAL-LT7826-AZ is easy to set up for evaluation of its performance. See [Figure 1](#) for proper equipment setup and use the following procedure.

1. Set S1 to OFF and set S2 to SWITCHED CAP.
2. With the power off, connect the positive terminal of the power supply to VHIGH (J1) and the negative terminal to GND (J2).
3. Connect an electronic load between VLOW (J3) and GND (J4).
4. Set the power supply to 16V and turn it on.
5. Change S1 to ON. Verify that $V_{LOW} = 8V$.
6. Once the proper V_{LOW} has been observed, power on the electronic load to an I_{LOW} within the operating range. Then, the V_{HIGH} and load may be adjusted to the desired values (within the operating range) to evaluate voltage regulation, ripple voltage, efficiency, and other performances.

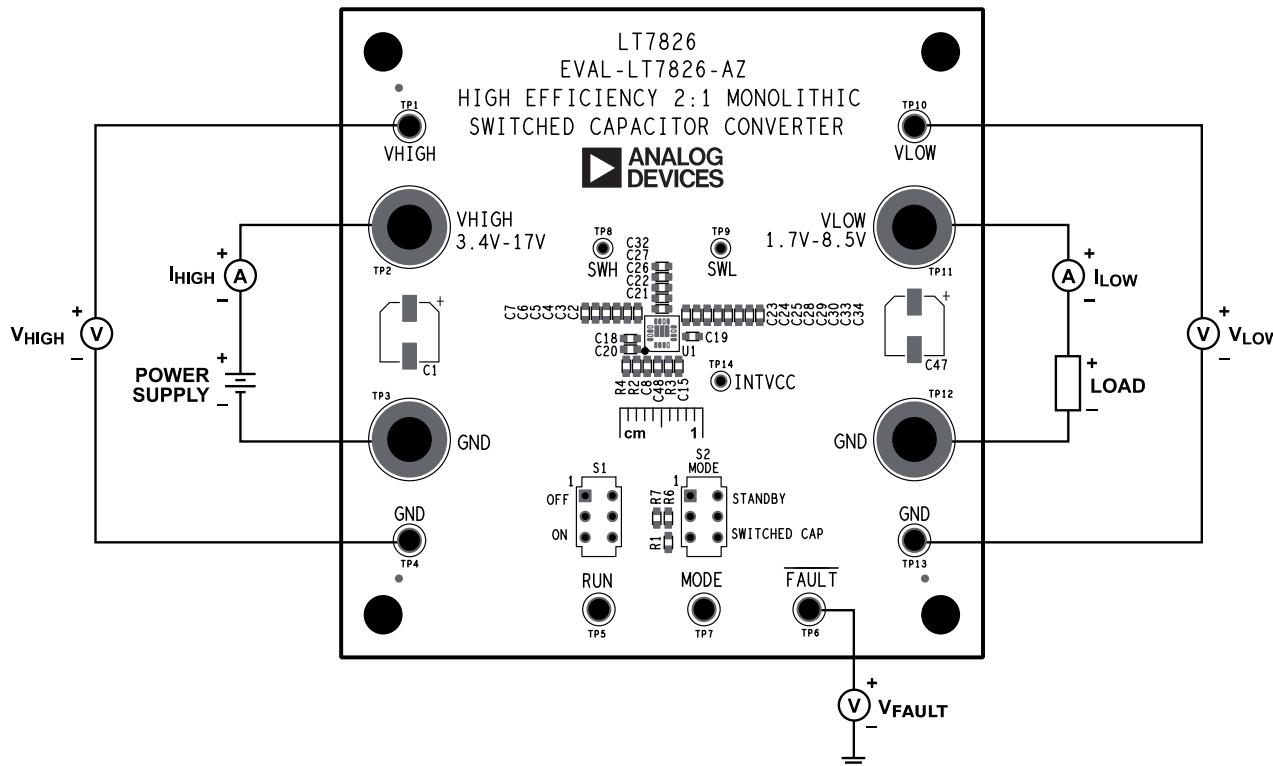
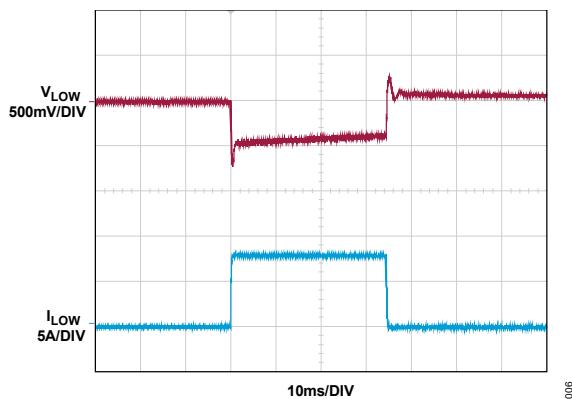
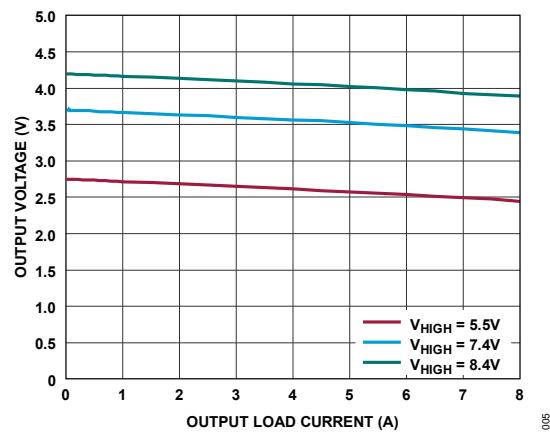
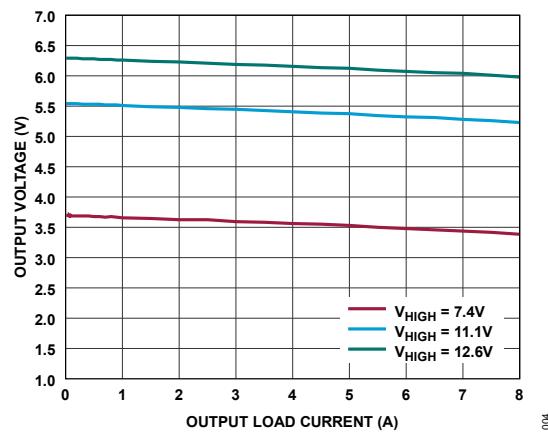
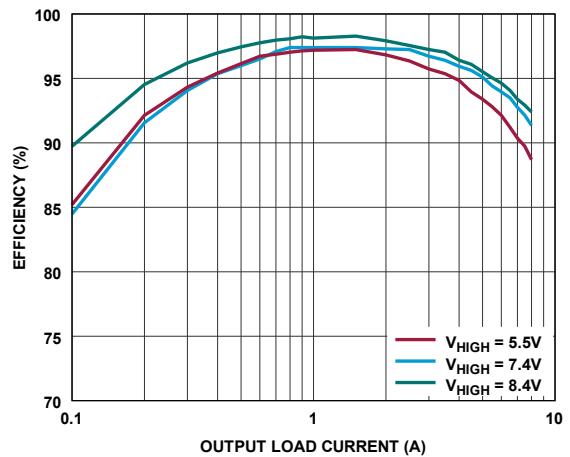
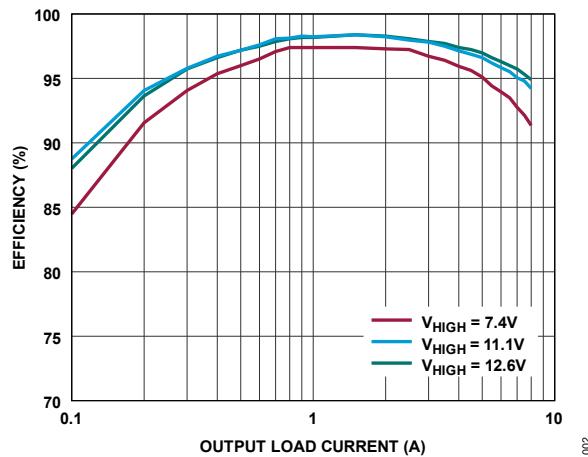


Figure 1. EVAL-LT7826-AZ Setup Diagram

Typical Performance Characteristics



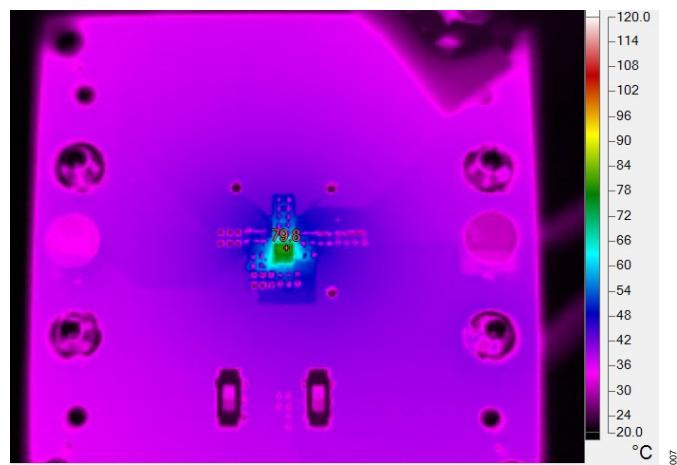


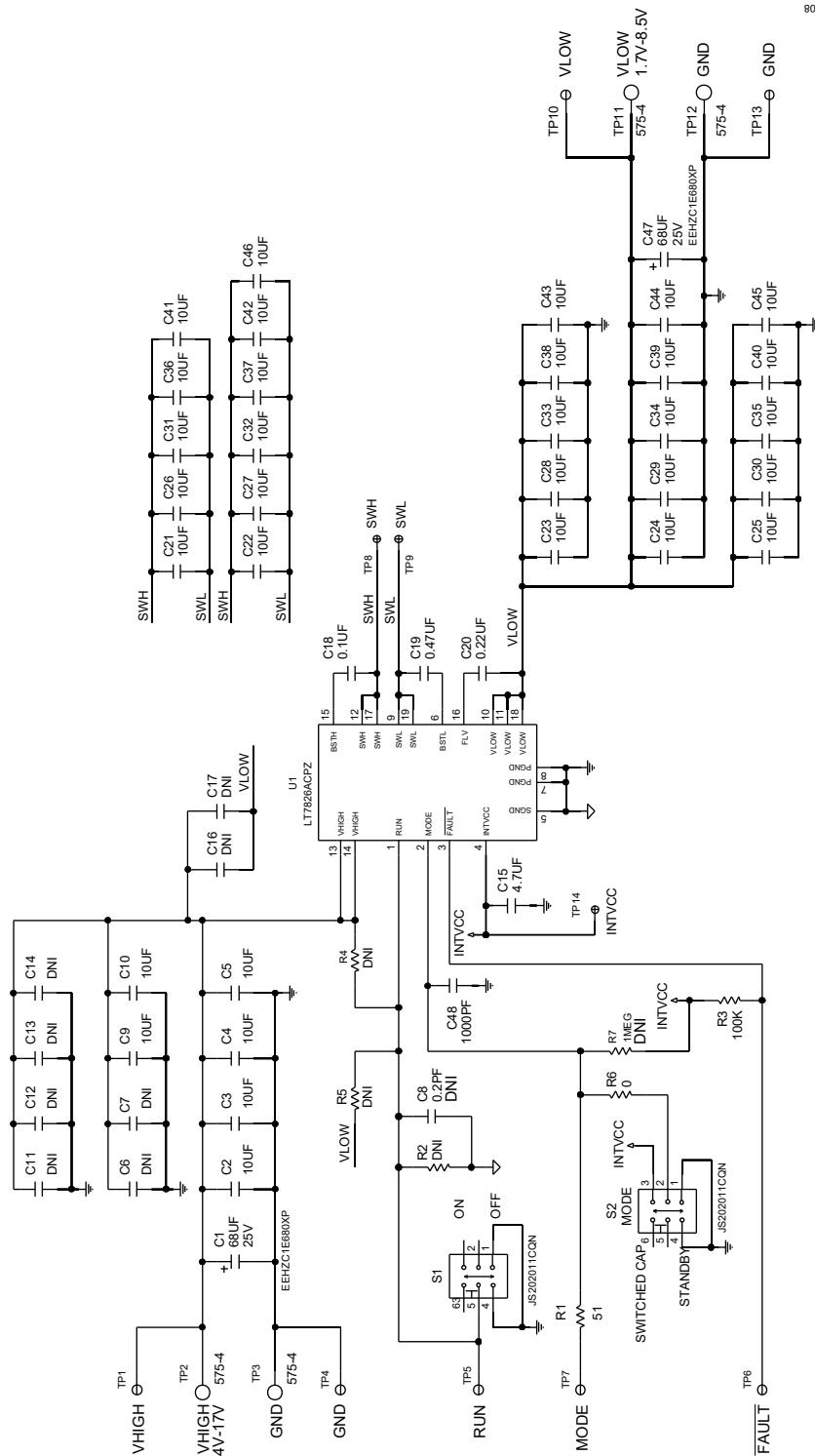
Figure 7. Thermal Performance at $V_{HIGH} = 12.6V$, $I_{LOW} = 8A$, $25^{\circ}C$ Ambient, No Airflow

EVAL-LT7826-AZ Bill of Materials

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
REQUIRED CIRCUIT COMPONENTS				
1	2	C1, C47	CAP ALUM POLY 68UF 25V 20% 6.3 x 7.7MM AEC-Q200 0.03Ω 1400mA 4000H	PANASONIC, EEHZC1E680XP
2	32	C2, C3, C4, C5, C9, C10, C21, C22, C23, C24, C25, C26, C27, C28, C29, C30, C31, C32, C33, C34, C35, C36, C37, C38, C39, C40, C41, C42, C43, C44, C45, C46	CAP CER 10µF 25V 20% X5R 0603	MURATA, GRM188R61E106MA73D
3	1	C15	CAP CER 4.7µF 10V 10% X5R 0603	KEMET, C0603C475K8PACTU
4	1	C18	CAP CER 0.1µF 25V 10% X7R 0603	KEMET, C0603C104K3RACTU
5	1	C19	CAP CER 0.47µF 50V 10% X7R 0603	TAIYO YUDEN, UMK107B7474KA-TR
6	1	C20	CAP CER 0.22µF 25V 10% X7R 0603	KEMET, C0603C224K3RACTU
7	1	C48	CAP CER 1000pF 25V 10% X7R 0603	AVX CORPORATION, 06033C102KAT2A
8	1	R1	RES SMD 51Ω 5% 1/10W 0603	BOURNS, CR0603-JW-510ELF
9	1	R3	RES SMD 100KΩ 1% 1/10W 0603 AEC-Q200	PANASONIC, ERJ-3EKF1003V
10	1	R6	RES SMD 0Ω JUMPER 1/10W 0603 AEC-Q200	PANASONIC, ERJ-3GEY0R00V
11	1	U1	IC-ADI LOW IQ, 16V / 8A (MAX) SWITCH CAPACITOR 2:1 CONVERTER OR BATTERY STACK ACTIVE BALANCER PRELIM	ANALOG DEVICES, LT7826ACPZ
OPTIONAL CIRCUIT COMPONENTS				
1	0	C6, C7, C11, C12, C13, C14, C16, C17	DO NOT INSTALL (TBD_C0603), USE SYM_3 AND/OR SYM_4	TBD0603, TBD0603
2	0	C8	DO NOT INSTALL (TBD_C0603), USE SYM_3 AND/OR SYM_4	TBD0603, TBD0603
3	0	R2	DO NOT INSTALL (TBD_C0603), USE SYM_3 AND/OR SYM_4	TBD0603, TBD0603
4	0	R4	DO NOT INSTALL (TBD_C0603), USE SYM_3 AND/OR SYM_4	TBD0603, TBD0603
5	0	R5	DO NOT INSTALL (TBD_C0603), USE SYM_3 AND/OR SYM_4	TBD0603, TBD0603

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
6	0	R7	DO NOT INSTALL (TBD_C0603), USE SYM_3 AND/OR SYM_4	TBD0603, TBD0603
HARDWARE – FOR EVALUATION CIRCUIT ONLY				
1	2	S1, S2	SWITCH SLIDE DPDT 300MA 6V	C&K, JS202011CQN
2	7	TP1, TP4, TP5, TP6, TP7, TP10, TP13	CONN-PCB SOLDER TERMINAL TEST POINT TURRET 0.094" MTG. HOLE PCB 0.062 INCH THK	MILL-MAX, 2501-2-00-80-00-00-07-0
3	4	TP2, TP3, TP11, TP12	CONN-PCB, BANANA JACK, FEMALE, NON-INSULATED, THT, SWAGE, 0.218 INCHES LENGTH	KEYSTONE ELECTRONICS, 575-4

EVAL-LT7826-AZ Schematic Diagram



Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	06/25	Initial release	—

Notes

ALL INFORMATION CONTAINED HEREIN IS PROVIDED "AS IS" WITHOUT REPRESENTATION OR WARRANTY. NO RESPONSIBILITY IS ASSUMED BY ANALOG DEVICES FOR ITS USE, NOR FOR ANY INFRINGEMENTS OF PATENTS OR OTHER RIGHTS OF THIRD PARTIES THAT MAY RESULT FROM ITS USE. SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE. NO LICENSE, EITHER EXPRESSED OR IMPLIED, IS GRANTED UNDER ANY ADI PATENT RIGHT, COPYRIGHT, MASK WORK RIGHT, OR ANY OTHER ADI INTELLECTUAL PROPERTY RIGHT RELATING TO ANY COMBINATION, MACHINE, OR PROCESS, IN WHICH ADI PRODUCTS OR SERVICES ARE USED. TRADEMARKS AND REGISTERED TRADEMARKS ARE THE PROPERTY OF THEIR RESPECTIVE OWNERS. ALL ANALOG DEVICES PRODUCTS CONTAINED HEREIN ARE SUBJECT TO RELEASE AND AVAILABILITY.