EVAL-LT8622S-AZ User Guide

LT8622S-AZ 18V, 2A Step-Down Silent Switcher with Low Noise Reference

General Description

The demonstration circuit EVAL-LT8622S-AZ is a 18V, 2A synchronous Silent Switcher 3® step-down regulator with ultra-low noise, high efficiency, and power density featuring the LT8622S. The input voltage range of EVAL-LT8622S-AZ is 2.7V to 18V. The default demo board setting is 1.0V at 2A maximum DC output current. The LT8622S is a compact, ultra-low noise, ultra-low emission, high efficiency, and high speed synchronous monolithic step-down switching regulator. The uniquely designed combination of the ultra-low noise reference and third-generation Silent Switcher architecture enables the LT8622S to achieve both high efficiency and excellent wideband noise performance. Minimum on-time of 12ns allows high V_{IN} to low V_{OUT} conversion at high frequency.

Program the LT8622S switching frequency either through the oscillator resistor or external clock over a 300kHz to 6MHz range. The default frequency of demo circuit EVAL-LT8622S-AZ is 2MHz. The SYNC pin on the demo board is grounded by default for low ripple pulse skip mode operation. To synchronize to an external clock, move JP1 to SYNC and apply the external clock to the SYNC terminal. Select the forced continuous mode (FCM) respectively by moving the JP1 shunt. **Figure 1** shows the efficiency of the circuit at 5V input and 12V input in the force continuous mode operation (input from V_{IN} terminal). Figure 2 shows the LT8622S temperature rising on the EVAL-LT8622S-AZ demo board under 1A and 2A load conditions.

The demo board has an EMI filter option. This EMI filter can be included by soldering additional 22µF, 25V, 1210 capacitors for C3, C6. Figure 3 shows the EMI performance of the board. The red line in Radiated EMI Performance is the CISPR32 Class B limit. In addition to the excellent EMI performance, the regulator also features ultra-low noise over a wide frequency range, as shown in Figure 4.

The LT8622S data sheet gives a complete description of the part, including operation and application information. Read the data sheet in conjunction with this demo manual for demo circuit EVAL-LT8622S-AZ. The LT8622S is assembled in a 4mm x 3mm LQFN package with exposed ground pads for low thermal resistance. The layout recommendations for low EMI operation and maximum thermal performance are available in the data sheet section ‘Low EMI PCB Layout and Thermal Considerations’.

Design files for this circuit board are available.

Performance Summary Specifications are at T_A =25°C

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Input Voltage Range V_{IN}		2.7		18	V
Output Voltage		0.992	1.0	1.008	V
Default Switching Frequency		1.93	2.0	2.07	MHz
Maximum Output Current	Derating is Necessary for Certain V_{IN} and Thermal Conditions	2			
Efficiency	V_{IN} = 12V f_{SW} = 2MHz V_{OUT} = 1.0V at I_{OUT} = 2A		84		%

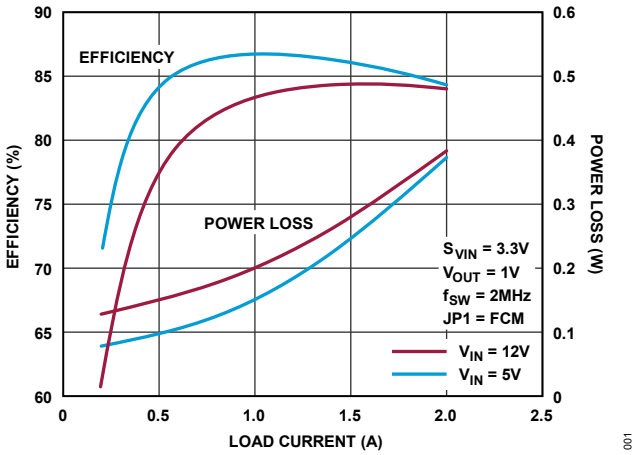


Figure 1. LT8622S Demo Circuit EVAL-LT8622S-AZ Efficiency vs. Load Current (Input from V_{IN} Terminal)

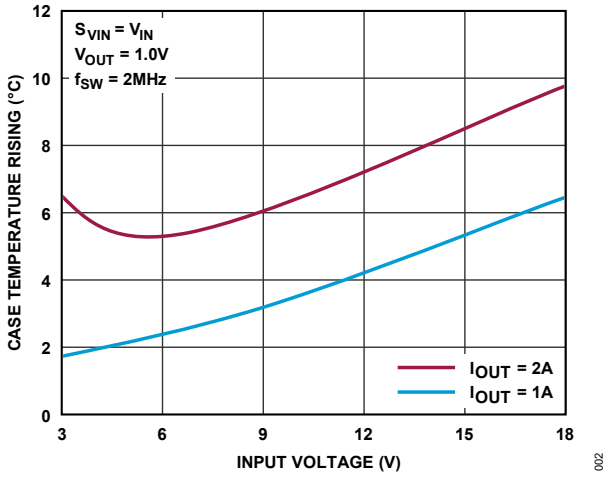


Figure 2. Temperature Rising vs. V_{IN}

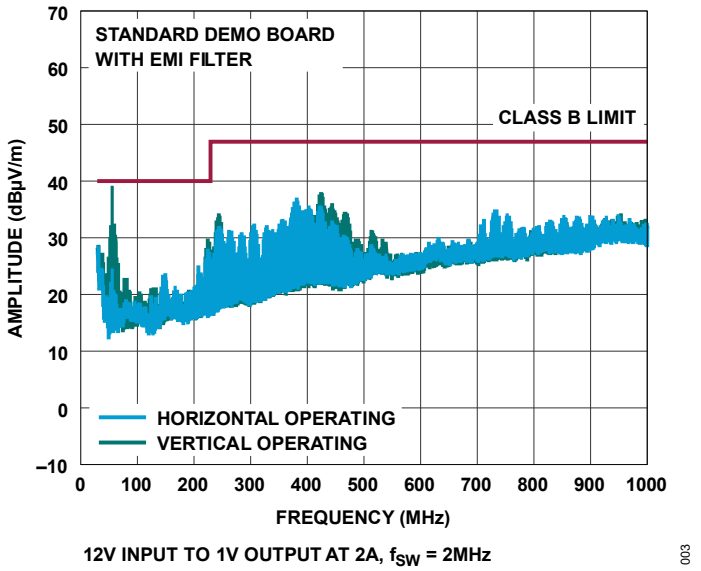


Figure 3. LT8622S Demo Circuit EVAL-LT8622S-AZ EMI Performance (12V Input to 1.0V Output at 2A, f_{SW} = 2MHz)

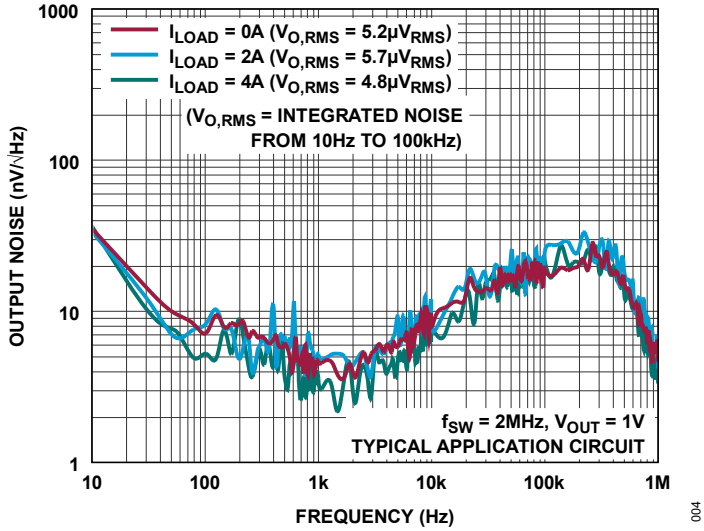


Figure 4. LT8622S Data Sheet Typical Application Circuit Noise Spectral Density (12V Input to 1.0V Output, f_{SW} = 2MHz)

Quick Start Procedure

The demonstration circuit EVAL-LT8622S-AZ is easy to set up to evaluate the performance of LT8622S. See Figure 5 for proper equipment setup and follow these test procedures.

NOTE: When measuring the input or output voltage ripple, be careful to avoid a long ground lead on the oscilloscope probe. For input voltage ripple, local/remote output voltage ripple, measure them through the U.FL connectors through V_{IN_SENSE}, V_{O_LOCAL}, and V_{O_SENSE}. Figure 6 shows the output voltage ripple measured at the output capacitor C21 through the V_{O_SENSE} U.FL connector.

1. Place JP1 on the FCM position.
2. With power off, connect the input power supply to V_{IN} (E1) and GND (E2).
3. With power off, connect the load from V_{OUT} (E19) to GND (E20).
4. Connect the DMM between the input test points: V_{IN_SENSE} (E3) and SENSE_GND (E4) to monitor the input voltage. Connect DMM between V_{O_SENSE} (E10) and SENSE_GND (E11) to monitor the output voltage
5. Turn on the power supply at the input.
6. Check for the proper output voltage (V_{OUT} = 1V).
7. Once the input and output voltages are properly established, adjust the load current within the operating range of 0A to 2A maximum per channel. Observe the output voltage regulation, output voltage ripples, switching node waveform, load transient response, and other parameters.
8. Add an external clock to the SYNC terminal when using the SYNC function (JP1 on the SYNC position). Choose the RT resistor (R4) to set the LT8622S switching frequency at least 20% below the lowest SYNC frequency.

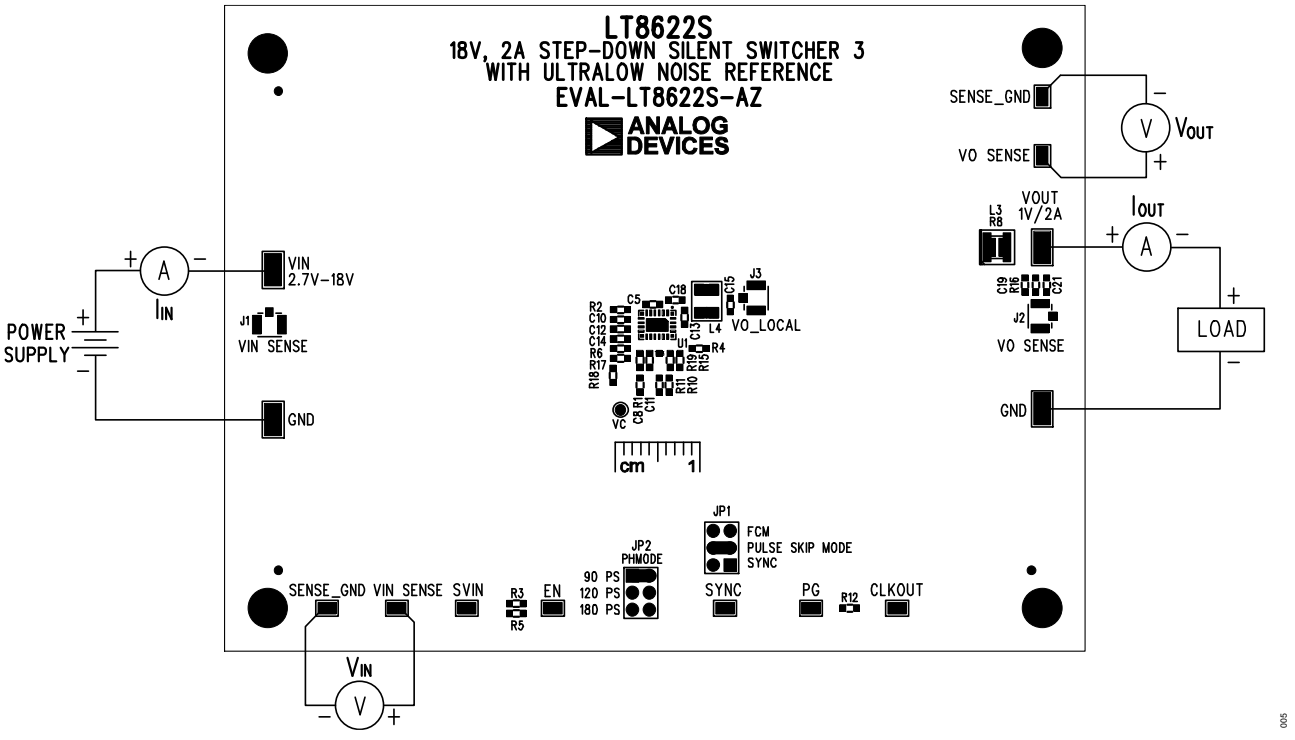


Figure 5. Proper Measurement Equipment Setup

Typical Performance Characteristics

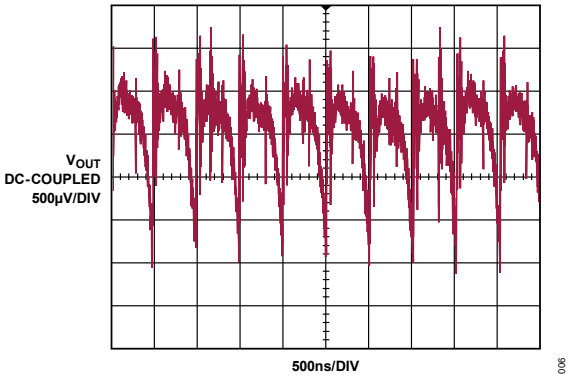


Figure 6. LT8622S Demo Circuit EVAL-LT8622S-AZ Output Voltage Ripple Measured Through J2

(12V Input, Remote Sense Enabled, I_{OUT} = 2A, 200MHz BW)

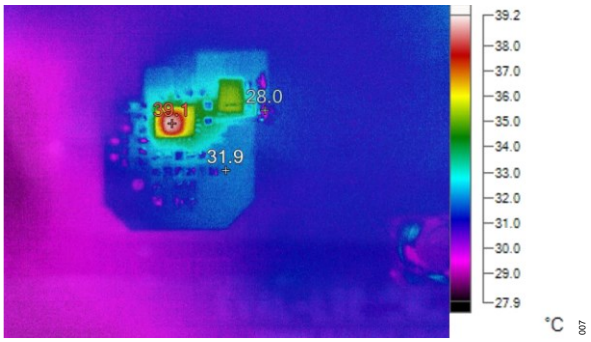


Figure 7. Thermal Performance at V_{IN} = 12V, S_{VIN} = V_{IN}, f_{SW} = 2MHz, V_{OUT} = 1.0V, I_{LOAD} = 2A, T_A = 25°C.

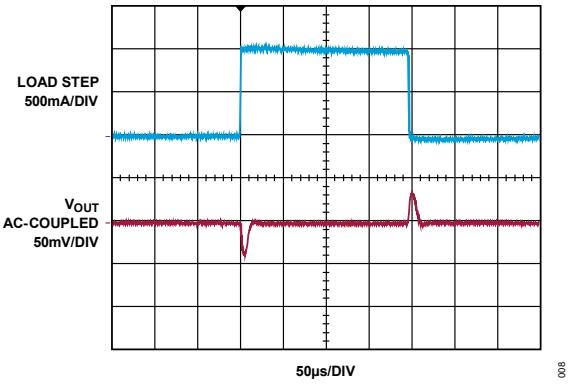
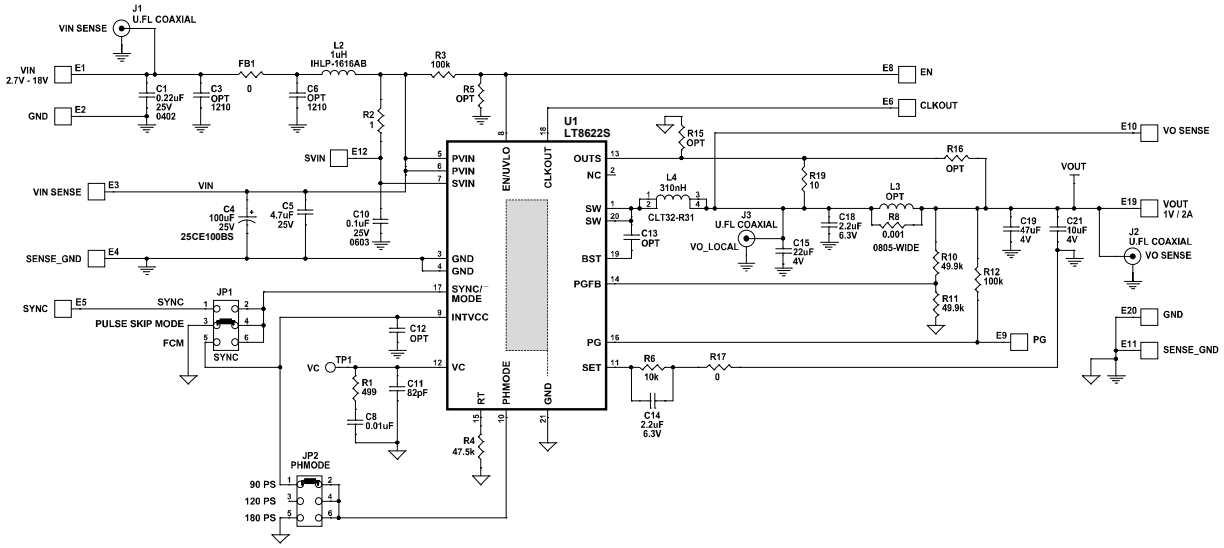


Figure 8. Transient Response with Load Steps 0A to 1A to 0A at dI/dt =1A/µs. V_{OUT} measured at J3.

LT8622S EV Kit Bill of Materials

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
1	1	C1	CAP., 0.22µF, X7R, 25V, 10%, 0402	TDK, CGA2B3X7R1E224K050BB
2	0	C3, C6	CAP., OPTION,1210	
3	1	C4	CAP.,100µF, ALUM ELECT, 25V, 20%, 6.3mm x 7.7mm, CE-BS SERIES	SUN ELECTRONIC INDUSTRIES CORP, 25CE100BS
4	1	C5	CAP., 4.7µF, X5R, 25V, 10%, 0603	MURATA, GRM188R61E475KE15D
5	1	C8	CAP., 0.01µF, X7R, 50V, 10%, 0603	
6	1	C10	CAP., 0.1µF, X7R, 25V, 10%, 0603	AVX, 06035C103KAT2A
7	1	C11	CAP., 82pF, X7R, 50V, 10%, 0603	AVX, 06033C104KAT2A
8	0	C12, C13	CAP., OPTION,0603	
9	2	C14, C18	CAP., 2.2µF, X7R, 6.3V, 10%, 0603, AEC-Q200	MURATA, GCM188R70J225KE22J
10	1	C15	CAP., 22µF, X7R, 4V, 20%, 0603	YAGEO, CC0805KKX7R5BB225
11	2	C19	CAP., 47µF, X5R, 4V, 20%, 0603	MURATA, GRM188R60G476ME15D
12	1	C21	CAP., 10µF, X7S, 4V, 20%, 0603	TDK, C1608X7S0G106M080AB
13	4	E1, E2, E19, E20	TEST POINT, SILVER PLATE, PHOSPHOR BRONZE, 3.81mm x 2.03mm, 2.29mm H, SMT	TE CONNECTIVITY, 1625854-2
14	11	E3 to E6, E8 to E12	TEST POINT, 0805, 2mm x 1.25mm x 1.45mm, PROBE PAD, FOIL,VERT, SMT, NATURAL	WURTH ELEKTRONIK, 885012206006
15	2	FB1, R18	RES., 0Ω, 1/10W, 0603, AEC-Q200	VISHAY, CRCW06030000Z0EA
16	2	J1, J2, J3	CONN., U.FL COAXIAL, RCPT, MALE, STR, SMT, Au	HIROSE ELECTRIC JST, U.FL-R-SMT-1(01) AYU1-1P-02676-120
17	2	JP1, JP2	CONN., HDR, MALE, 2mm x 3,2mm, VERT, ST, THT	WURTH ELEKTRONIK, 62000621121
18	1	L2	IND., 1µH, PWR, SHIELDED, 20%, 4A, 52.5mΩ, 1616AB, IHLP-01 Series	VISHAY, IHLP1616ABER1R0M01
19	1	L4	IND., 310nH, PWR, 20%, 12.1A , 5.3mΩ, SMD, SHIELDED	TDK, CLT32-R31
20	1	LB1	LABEL SPEC, DEMO BOARD SERIAL NUMBER	BRADY, THT-96-717-10
21	4	MH1 to MH4	STANDOFF, NYLON, SNAPON, 0.375"	KEYSTONE, 8832
22	1	PCB1	PCB, EVAL-LT8622S-AZ	ADI APPROVED SUPPLIER, 600-EVAL-LT8622S-AZ
23	1	R1	RES., 499Ω, 1%, 1/10W, 0603, AEC-Q200	VISHAY, CRCW0603499RFKEA
24	1	R2	RES.,1 Ω, 1%, 1/10W, 0603, AEC-Q200	NIC, NRC06F1R00TRF
25	2	R3, R12	RES.,100kΩ, 1%, 1/10W, 0603, AEC-Q200	VISHAY, CRCW0603100KFKEA
26	1	R4	RES.,47.5kΩ, 1%, 1/10W, 0603	VISHAY, CRCW060347K5FKEA
27	0	R5, R15, R16, R17	RES., OPTION, 0603	
28	1	R6	RES.,10kΩ, 1%, 1/10W, 0603, AEC-Q200	VISHAY, CRCW060310K0FKEA
29	1	R8	RES., 0.001Ω, 5%, 1W, 0805, LONG SIDE WRAP AROUND, METAL, SENSE, AEC-Q200	SUSUMU, KRL2012E-M-R001-J-T5
30	2	R10, R11	RES., 49.9kΩ, 1%, 1/10W, 0603	VISHAY, CRCW060349K9FKEA
31	1	R19	RES., 10Ω, 1%, 1/10W, 0603	VISHAY, CRCW06030000Z0EA
32	1	U1	IC, SYNC. STEP-DOWN SILENT SWITCHER, LQFN-20	ANALOG DEVICES, LT8622SAV#PBF
33	2	XJP1, XJP2	CONN., SHUNT, FEMALE, 2-POS, 2mm	WURTH ELEKTRONIK, 60800213421

LT8622S EV Kit Schematic



NOTES: UNLESS OTHERWISE SPECIFIED

1. ALL RESISTORS ARE 0603.
   ALL CAPACITORS ARE 0603.

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
A	04/24	Initial release for open market	—