

LT8642-1

18V, 10A Synchronous Step-Down Silent Switcher

DESCRIPTION

Demonstration circuit 3162A is a 18V, 10A synchronous step-down Silent Switcher® with spread spectrum frequency modulation featuring the [LT®8642-1](#). The demo board is designed for 1.2V output from a 2.8V to 18V input. The LT8642-1 is a compact, low emission, high efficiency, and high speed synchronous monolithic step-down switching regulator. Special Silent Switcher architecture minimizes EMI emissions. Selectable spread spectrum mode can further improve EMI performance. Fast minimum on-time of 20ns enables high V_{IN} to low V_{OUT} conversion at high frequency.

The LT8642-1 switching frequency can be programmed either via a resistor or external clock over a 200kHz to 3MHz range. The default frequency of demo circuit 3162A is 2MHz. The LT8642-1 SYNC/MODE pin on the demo board is grounded (JP1 at BURST position) by default for

low ripple Burst Mode® operation. Spread spectrum mode and forced continuous mode can be selected respectively by moving JP1 shunt. To synchronize to an external clock, move JP1 to FCM/SYNC and apply the external clock to the SYNC terminal.

The LT8642-1 data sheet gives a complete description of the part, operation, and application information. The data sheet must be read in conjunction with this demo manual for demo circuit 3162A. The LT8642-1 is assembled in a 3mm × 4mm LQFN package with exposed 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.](#)

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

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
V_{IN}	Input Supply Range		2.8		18	V
V_{OUT}	Output Voltage	$R3 = 100\text{k}\Omega$, $R7 = 100\text{k}\Omega$, $V_{IN} = 12\text{V}$	1.17	1.2	1.23	V
I_{OUT}	Maximum Output Current		10			A
f_{SW}	Switching Frequency	$R2 = 17.8\text{k}\Omega$, JP1 = FCM/SYNC	1.925	2	2.05	MHz
EFF	Efficiency	$V_{IN} = 12\text{V}$, $V_{BIAS} = 3.3\text{V}$, $V_{OUT} = 1.2\text{V}$, $I_{OUT} = 10\text{A}$		83.5		%

QUICK START PROCEDURE

Demonstration circuit 3162A is easy to set up to evaluate the performance of the LT8642-1. Refer to Figure 1 for proper measurement equipment setup and follow the procedure below:

1. Place JP1 on BURST position.
2. With power off, connect the input power supply to VIN and GND. If the input EMI filter is desired, connect the input power supply to VIN_EMI and GND.
3. With power off, connect the load from VOUT to GND.
4. To read the input voltage and output voltage accurately, the voltage meters should be connected to VIN SENSE and VO SENSE turret pins.

5. Turn on the power at the input.

NOTE: Make sure that the input voltage does not exceed 18V.

6. Check for the proper output voltage ($V_{OUT} = 1.2V$).

NOTE: If there is no output, temporarily disconnect the load to make sure that the load is not set too high or is shorted.

7. Once the proper output voltage is established, adjust the load within the operating ranges and observe the output voltage regulation, ripple voltage, efficiency, and other parameters.

NOTE: When measuring the input or output voltage ripple, care must be taken to avoid a long ground lead on the oscilloscope probe. Measure the output voltage ripple by touching the probe tip directly across the output capacitor. See Figure 2 for the proper scope technique.

8. JP1 can also set LT8642-1 in spread spectrum mode (JP1 on the SPREAD-SPECTRUM position) or forced continuous mode (JP1 on the FCM/SYNC position). An external clock can be added to the SYNC terminal when SYNC function is used (JP1 on the FCM/SYNC position). Please make sure that R2 should be chosen to set the LT8642-1 switching frequency equal to or below the lowest SYNC frequency.

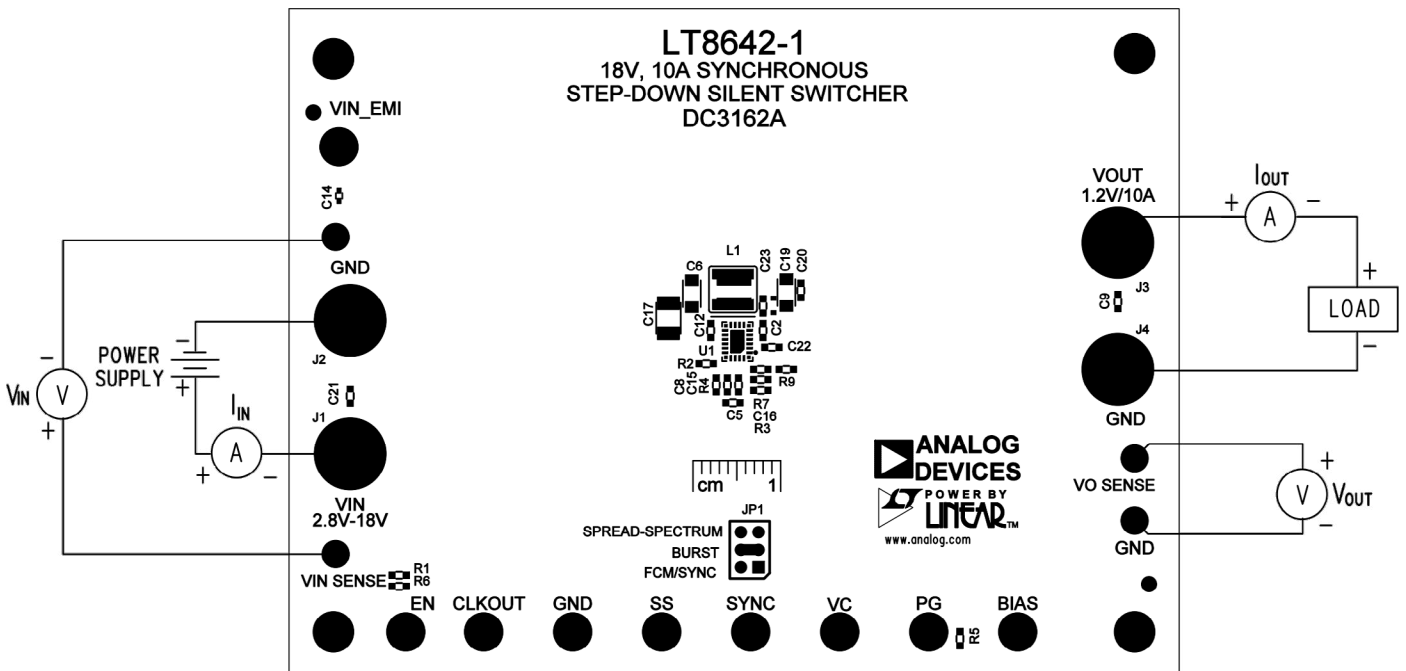


Figure 1. Proper Measurement Equipment Setup

QUICK START PROCEDURE

Figure 3 shows the efficiency of demo circuit 3162A at 5V input and 12V input in Forced Continuous Mode Operation (input from VIN terminal, JP1 = FCM/SYNC). Figure 4 shows the LT8642-1 temperature rising on DC3162A demo board under room condition, with 8A load and 10A load.

The demo board has an EMI filter installed. This EMI filter can be included by applying the input voltage at VIN_EMI terminal.

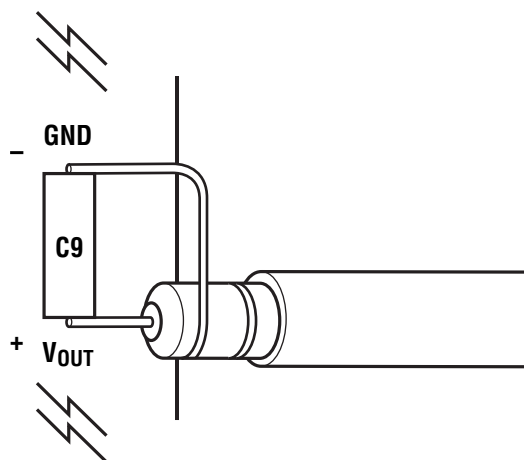


Figure 2. Measuring Output Ripple at Output Capacitor C9

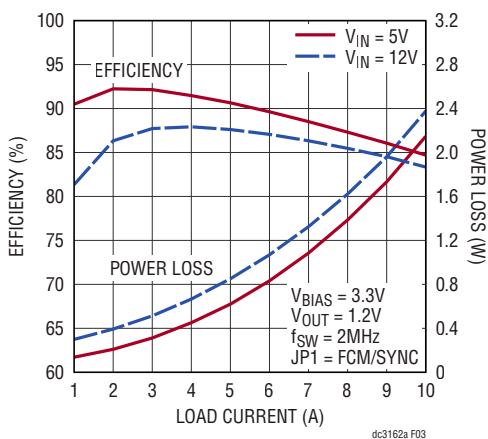


Figure 3. LT8642-1 Demo Circuit DC3162A Efficiency vs Load Current (Input from VIN Terminal)

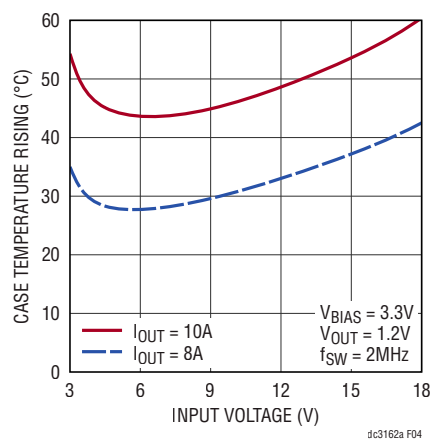


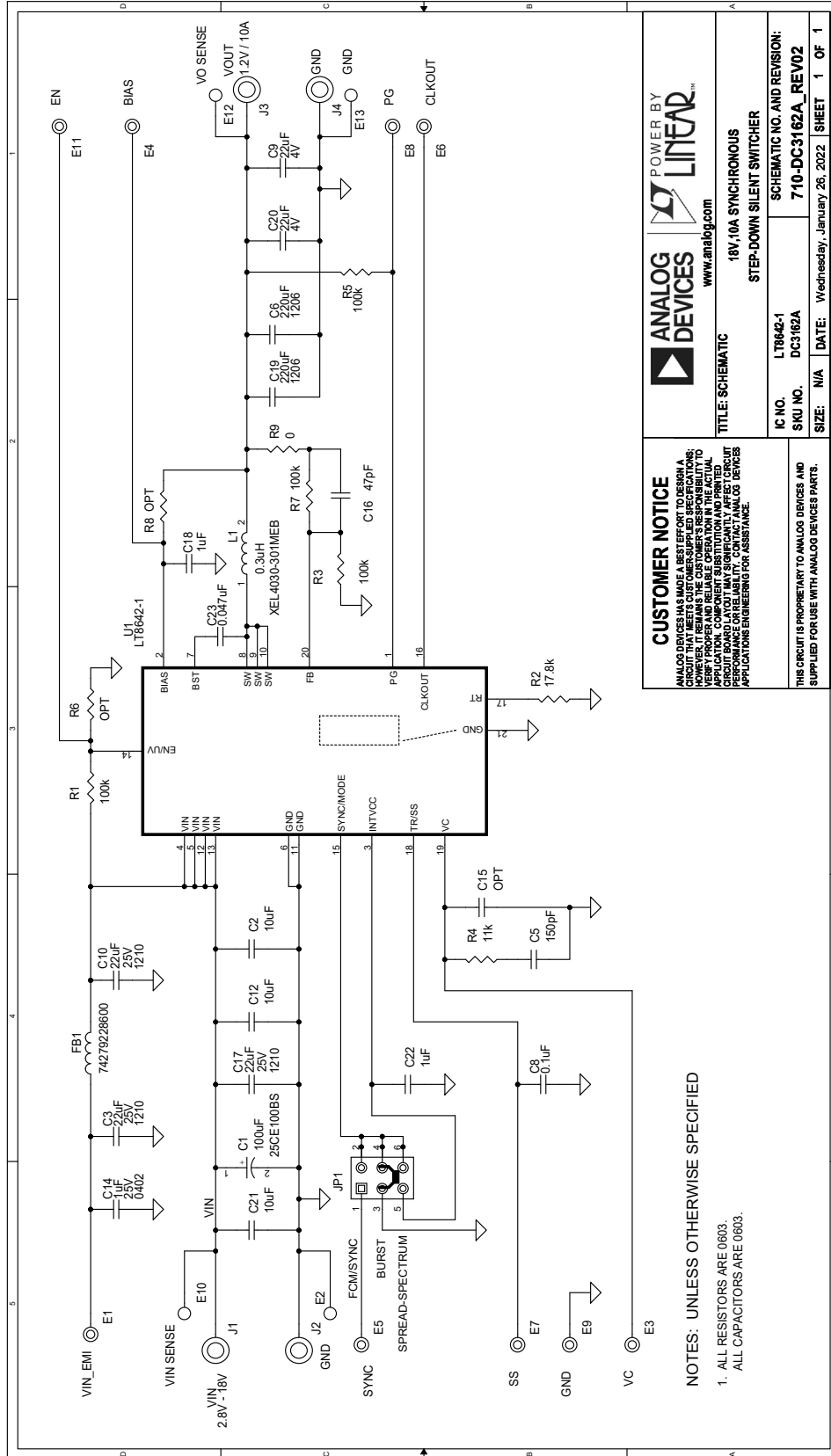
Figure 4. LT8642-1 Demo Circuit DC3162A Case Temperature Rising vs Input Voltage

DEMO MANUAL DC3162A



PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Required Circuit Components				
1	2	C2, C12	CAP., 10 μ F, X5R, 25V, 20%, 0603	MURATA, GRM188R61E106MA73D
2	1	C5	CAP., 150pF, C0G, 50V, 5%, 0603	MURATA, GRM1885C1H151JA01D
3	2	C6, C19	CAP., 220 μ F, X5R, 4V, 20%, 1206	MURATA, GRM31CR60G227ME11L
4	1	C8	CAP., 0.1 μ F, X7R, 16V, 10%, 0603	MURATA, GRM188R71C104KA01D
5	2	C9, C20	CAP., 22 μ F, X5R, 4V, 20%, 0603	MURATA, GRM188R60G226MEA0D
6	1	C16	CAP., 47pF, C0G, 50V, 5%, 0603	MURATA, GRM1885C1H470JA01D
7	1	C17	CAP., 22 μ F, X7R, 25V, 10%, 1210	MURATA, GRM32ER71E226KE15L
8	1	C22	CAP., 1 μ F, X7R, 10V, 10%, 0603	MURATA, GRM188R71A105KA61D
9	1	C23	CAP., 0.047 μ F, X7R, 25V, 10%, 0603	TDK, C1608X7R1E473K
10	1	L1	IND., 0.3 μ H	COILCRAFT, XEL4030-301MEB
11	4	R1, R3, R5, R7	RES., 100k, 1%, 1/10W, 0603	VISHAY, CRCW0603100KFKEA
12	1	R2	RES., 17.8k, 1%, 1/10W, 0603	VISHAY, CRCW060317K8FKEA
13	1	R4	RES., 11k, 1%, 1/10W, 0603	VISHAY, CRCW060311K0FKEA
14	1	U1	IC, STEP-DOWN SWITCHER, 3mm \times 4mm LQFN	ANALOG DEVICES, LT8642EV-1#PBF
Additional Demo Board Circuit Components				
1	1	C1	CAP., 100 μ F, ALUM. ELECT., 25V	SUN ELECT., 25CE100BS
2	2	C3, C10	CAP., 22 μ F, X7R, 25V, 10%, 1210	MURATA, GRM32ER71E226KE15L
3	1	C14	CAP., 1 μ F, X5R, 25V, 10%, 0402	MURATA, GRM155R61E105KA12D
4	0	C15 (OPT)	CAP., OPTION, 0603	
5	1	C18	CAP., 1 μ F, X5R, 25V, 10%, 0603	MURATA, GRM188R61E105KA12D
6	1	C21	CAP., 10 μ F, X5R, 25V, 20%, 0603	MURATA, GRM188R61E106MA73D
7	1	FB1	BEAD, FERRITE, 60 Ω AT 100MHz, 0603	WURTH ELEKTRONIK, 74279228600
8	0	R6, R8 (OPT)	RES., OPTION, 0603	
9	1	R9	RES., 0 Ω , 1/10W, 0603	VISHAY, CRCW06030000Z0EA
Hardware: For Demo Board Only				
1	9	E1, E3-E9, E11	TESTPOINT, TURRET, 0.094"	MILL-MAX, 2501-2-00-80-00-00-07-0
2	4	E2, E10, E12, E13	TESTPOINT, TURRET, 0.064"	MILL-MAX, 2308-2-00-80-00-00-07-0
3	4	J1-J4	BANANA JACK	KEYSTONE, 575-4
4	1	JP1	2 \times 3, 0.079" DOUBLE ROW HEADER	WURTH ELEKTRONIK, 62000621121
5	4	MP1-MP4	STAND-OFF, NYLON, 0.50" TALL	KEYSTONE, 8833
6	1	XJP1	SHUNT, 0.079" CENTER	WURTH ELEKTRONIK, 60800213421

SCHEMATIC DIAGRAM



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 ANALOG DEVICES PROVIDES DESIGN RESOURCES, INCLUDING REFERENCE DESIGNS, TO ASSIST YOU IN YOUR DESIGN EFFORTS. HOWEVER, IT REMAINS THE CUSTOMER'S RESPONSIBILITY TO DESIGN, BUILD, TEST, AND VALIDATE THEIR APPLICATIONS. COMPONENT SUBSTITUTION AND PRINTED CIRCUIT BOARD LAYOUT MAY SIGNIFICANTLY AFFECT CIRCUIT PERFORMANCE. CONTACT AN ANALOG DEVICES APPLICATIONS ENGINEERING FOR ASSISTANCE.

 	
TITLE: SCHEMATIC 18V, 10A SYNCHRONOUS STEP-DOWN SILENT SWITCHER	
IC NO.	L78642-1
SKU NO.	DC3162A
SIZE:	N/A
DATE:	Wednesday, January 26, 2022
SHEET	1 OF 1

NOTES: UNLESS OTHERWISE SPECIFIED
 1. ALL RESISTORS ARE 0603.
 ALL CAPACITORS ARE 0603.



ESD Caution

ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

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