

## LT8627SP

# 18V, 16A Synchronous Step-Down Silent Switcher with Low Noise Reference

## DESCRIPTION

Demonstration circuit 3147A is a 18V, 16A synchronous step-down Silent Switcher® 3 with ultralow noise, high efficiency and power density featuring the [LT®8627SP](#). The input voltage range of DC3147A is 2.7V to 18V. The default demo board setting is 1V at 16A maximum DC output current. The LT8627SP is a compact, ultralow noise, ultralow emission, high efficiency, and high speed synchronous monolithic step-down switching regulator. The uniquely designed combination of the ultralow noise reference and the third-generation Silent Switcher architecture enables the LT8627SP to achieve both high efficiency and excellent wideband noise performance. Minimum on-time of 15ns allows high  $V_{IN}$  to low  $V_{OUT}$  conversion at high frequencies.

The LT8627SP switching frequency can be programmed either via oscillator resistor or external clock over a 300kHz to 4MHz range. The default frequency of demo circuit 3147A 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. Forced continuous mode (FCM) can be selected by moving JP1 shunt. Figure 1 shows the efficiency of

the circuit at 5V input and 12V input in forced continuous mode operation (input from  $V_{IN}$  terminal). Figure 2 shows the LT8627SP temperature rising on DC3147A demo board under 12A and 16A load conditions.

The demo board has an EMI filter installed by default between  $V_{IN}$  terminal and the IC. The EMI performance of the board is shown on Figure 3. The red line in Radiated EMI Performance is the CISPR32 Class B limit. In addition to the excellent EMI performance, the regulator also features ultralow noise over a wide frequency range, as is shown on Figure 4.

The LT8627SP data sheet gives a complete description of the part including operation and application information. The data sheet must be read in conjunction with this demo manual for demo circuit 3147A. The LT8627SP is assembled in a 4mm × 4mm LQFN package with exposed pads and exposed die 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 $T_A = 25^\circ\text{C}$

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Input Voltage Range $V_{IN}$		2.7		18	V
Output Voltage		0.992	1	1.008	V
Default Switching Frequency		1.93	2	2.07	MHz
Maximum Output Current	Derating is Necessary for Certain $V_{IN}$ and Thermal Conditions	16			A
Efficiency	$V_{IN} = 12\text{V}$ , $f_{SW} = 2\text{MHz}$ , $V_{OUT} = 1\text{V}$ at $I_{OUT} = 16\text{A}$		81.6		%

## PERFORMANCE SUMMARY

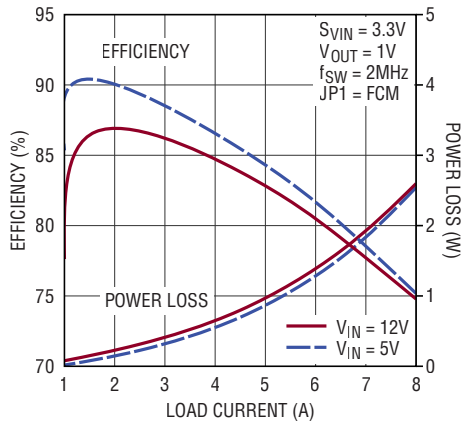


Figure 1. LT8627SP Demo Circuit DC3147A Efficiency vs Load Current (Input from VIN Terminal)

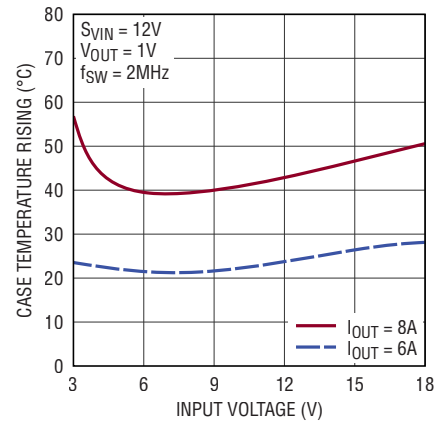


Figure 2. Temperature Rising vs  $V_{IN}$

### Radiated EMI Performance (CISPR32 Radiated Emission Test)

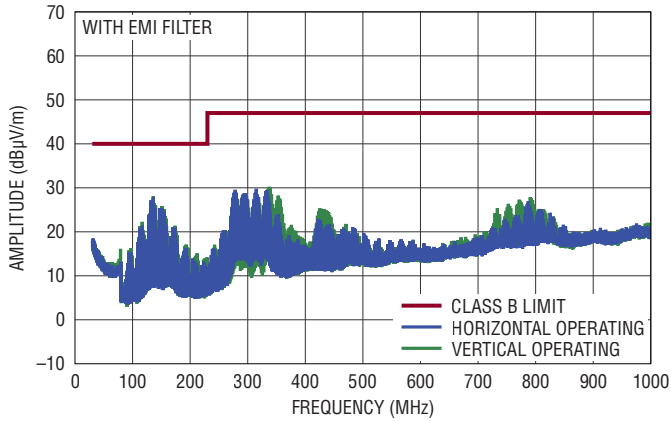


Figure 3. LT8627SP Demo Circuit DC3147A EMI Performance (12V Input to 1V Output at 16A,  $f_{SW} = 2\text{MHz}$ )

### Noise Spectral Density vs Load

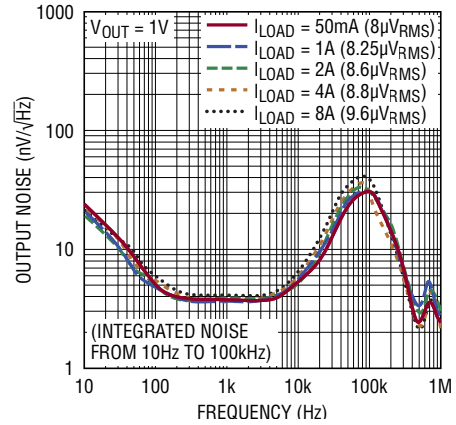


Figure 4. LT8627SP Demo Circuit DC3147A Noise Spectral Density (12V Input to 1V Output,  $f_{SW} = 2\text{MHz}$ )

## QUICK START PROCEDURE

Demonstration circuit 3147A is easy to set up to evaluate the performance of LT8627SP. Please refer to Figure 5 for proper equipment setup and follow the test procedures below:

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. For input voltage ripple and the remote output voltage ripple, they can also be measured through the SMA connectors via VIN\_SENSE and VO\_SENSE. Figure 6 shows the output voltage ripple measured at the output capacitor C22 through VO\_SENSE SMA connector.

1. Place JP1 on FCM position.
2. With power off, connect the input power supply to VIN (J1) and GND (J2).
3. With power off, connect the load from VOUT (J5) to GND (J6).

4. Connect the DMM between the input test points: VIN\_SENSE (E1) and SENSE\_GND (E2) to monitor the input voltage. Connect DMM between VO\_SENSE (E4) and SENSE\_GND (E7) to monitor the output voltage

5. Turn on the power supply at the input.

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

6. Check for the proper output voltage ( $V_{OUT} = 1V$ ).

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

7. Once the input and output voltages are properly established, adjust the load current within the operating range of 0A to 16A. Observe the output voltage regulation, output voltage ripples, switching node waveform, load transient response and other parameters.

8. An external clock can be added to the SYNC terminal when SYNC function is used (JP1 on the SYNC position). The  $R_T$  resistor (R4) should be chosen to set the LT8627SP switching frequency at least 20% below the lowest SYNC frequency.

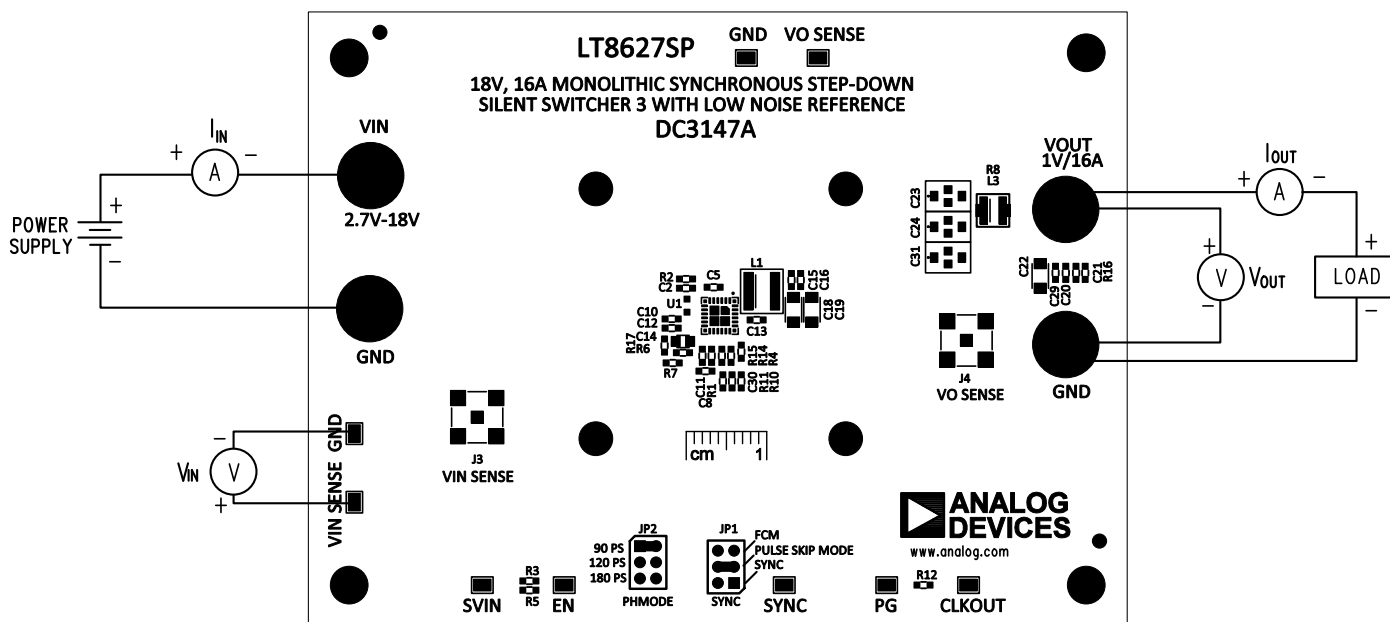


Figure 5. Proper Measurement Equipment Setup

## TYPICAL PERFORMANCE CHARACTERISTICS

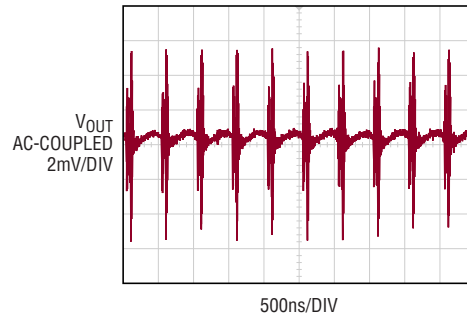


Figure 6. LT8627SP Demo Circuit DC3147A Output Voltage Ripple Measured through J6 (12V Input, I<sub>OUT</sub> = 16A, 200MHz BW)

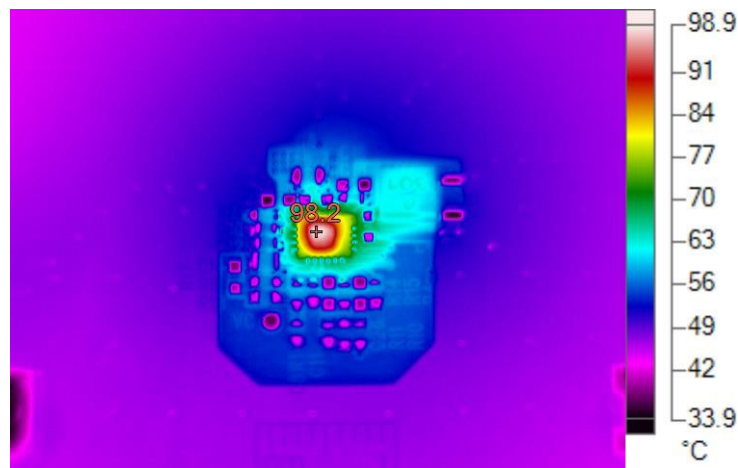


Figure 7. Thermal Performance at V<sub>IN</sub> = 12V, f<sub>SW</sub> = 2MHz, V<sub>OUT</sub> = 1V, I<sub>OUT</sub> = 16A, T<sub>A</sub> = 25°C

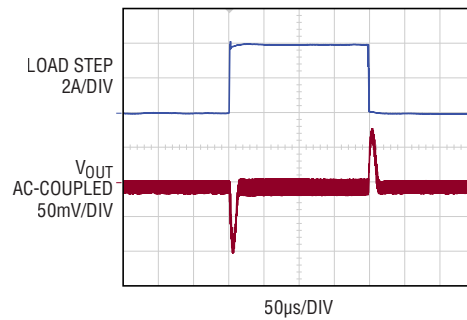


Figure 8. Transient Responses with Load Steps 0A to 4A to 0A at di/dt = 4A/µs

## PARTS LIST

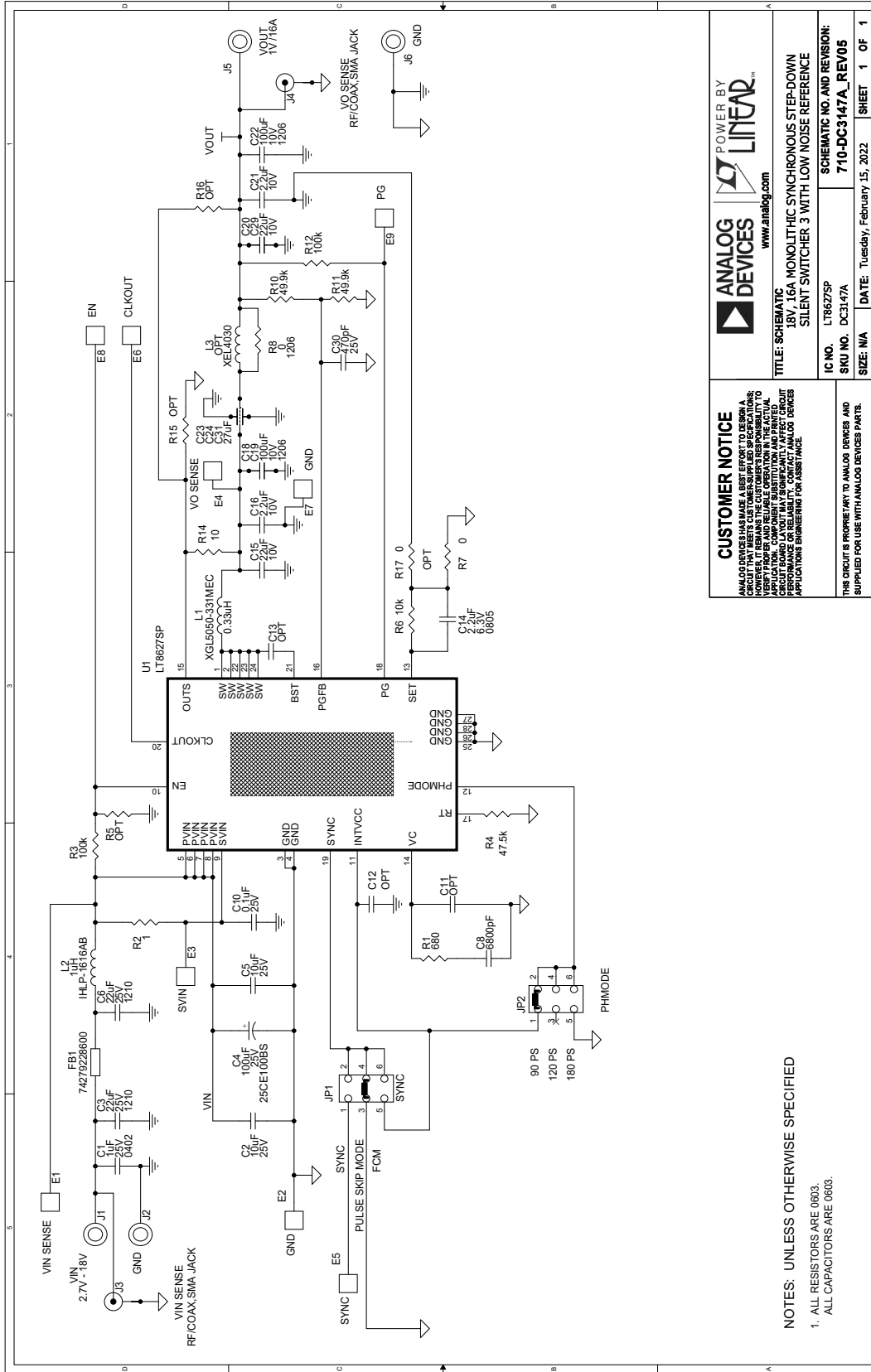
ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
<b>Required Circuit Components</b>				
1	1	C1	CAP., 1 $\mu$ F, X5R, 25V, 10%, 0402, AEC-Q200	MURATA, GRT155R61E105KE01D
2	2	C2, C5	CAP., 10 $\mu$ F, X5R, 25V, 20%, 0603	MURATA, GRM188R61E106MA73D
3	2	C3, C6	CAP., 22 $\mu$ F, X7R, 25V, 10%, 1210	AVX, 12103C226KAT2A
4	1	C4	CAP., 100 $\mu$ F, ALUM ELECT, 25V, 20%, 6.3mm $\times$ 7.7mm, CE-BS SERIES	SUN ELECTRONIC INDUSTRIES CORP, 25CE100BS
5	1	C8	CAP., 6800pF, X7R, 25V, 10%, 0603	YAGEO, CC0603KRX7R8BB682
6	1	C10	CAP., 0.1 $\mu$ F, X7R, 25V, 10%, 0603, AEC-Q200	TDK, CGA3E2X7R1E104K080AA
7	1	C14	CAP., 2.2 $\mu$ F, X7R, 6.3V, 10%, 0805	YAGEO, CC0805KKX7R5BB225
8	3	C15, C20, C29	CAP., 22 $\mu$ F, X5R, 10V, 20%, 0603	AVX, 0603ZD226MAT2A
9	2	C16, C21	CAP., 2.2 $\mu$ F, X7R, 10V, 10%, 0603	MURATA, GRM188R71A225KE15D
10	3	C18, C19, C22	CAP., 100 $\mu$ F, X5R, 10V, 20%, 1206	TDK, C3216X5R1A107M160AC
11	3	C23, C24, C31	CAP., 27 $\mu$ F, FEED THRU, 6.3V, 20%, 1206, 3-TERM, 5m $\Omega$ DCR, 6A	MURATA, NFM31PC276B0J3L
12	1	C30	CAP., 470pF, COG, 25V, 10%, 0603	AVX, 06033A471KAT2A
13	1	FB1	IND., 60 $\Omega$ AT 100MHz, PWR, FERRITE BEAD, 25%, 5100mA, 15m $\Omega$ , 0603	WURTH ELEKTRONIK, 74279228600
14	1	L1	IND., 0.33 $\mu$ H, PWR, SHIELDED, 20%, 24.6A, 2m $\Omega$ , 5.48mm $\times$ 5.28mm, XGL5050, AEC-Q200	COILCRAFT, XGL5050-331MEC
15	1	L2	IND., 1 $\mu$ H, PWR, SHIELDED, 20%, 4A, 52.5m $\Omega$ , 1616AB, IHLP-01 SERIES	VISHAY, IHLP1616ABER1R0M01
16	1	R1	RES., 680 $\Omega$ , 1%, 1/10W, 0603, AEC-Q200	PANASONIC, ERJ3EKF6800V
17	1	R2	RES., 1 $\Omega$ , 1%, 1/10W, 0603, AEC-Q200	NIC, NRC06F1R00TRF
18	2	R3, R12	RES., 100k, 1%, 1/10W, 0603, AEC-Q200	VISHAY, CRCW0603100KFKEA
19	1	R4	RES., 47.5k, 1%, 1/10W, 0603	VISHAY, CRCW060347K5FKEA
20	1	R6	RES., 10k, 1%, 1/10W, 0603, AEC-Q200	VISHAY, CRCW060310K0FKEA
21	1	R7	RES., 0 $\Omega$ , 1/10W, 0603, AEC-Q200	VISHAY, CRCW06030000Z0EA
22	1	R8	RES., 0 $\Omega$ , 1/4W, 1206, AEC-Q200	VISHAY, CRCW12060000Z0EA
23	2	R10, R11	RES., 49.9k, 1%, 1/10W, 0603	NIC, NRC06F4992TRF
24	1	R14	RES., 10 $\Omega$ , 1%, 1/10W, 0603	VISHAY, CRCW060310R0FKEA
25	1	U1	IC, STEP-DOWN SILENT SWITCHER 3, LQFN-24	ANALOG DEVICES, LT8627SPJV#PBF

# DEMO MANUAL DC3147A

## PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
<b>Additional Demo Board Circuit Components</b>				
1	0	C11-C13	CAP, OPTION, 0603	
2	0	L3	IND., 0.47 $\mu$ H, PWR, SHIELDED, 20%, 15.6A, 4.6m $\Omega$ , 4.3mm $\times$ 4.3mm, XEL4030, AEC-Q200	COILCRAFT, XEL4030-471MEB
3	0	R5, R15, R16	RES., OPTION, 0603	
4	0	R17	RES., 0 $\Omega$ , 1/10W, 0603, AEC-Q200	VISHAY, CRCW06030000Z0EA
<b>Hardware: For Demo Board Only</b>				
1	9	E1-E9	TEST POINT, 0805, 2mm $\times$ 1.25mm $\times$ 1.45mm, PROBE PAD, FOIL, VERT, SMT, NATURAL	TE CONNECTIVITY, 1625854-2
2	4	J1, J2, J5, J6	CONN., BANANA JACK, FEMALE, THT, NON-INSULATED, SWAGE, 0.218"	KEYSTONE, 575-4
3	2	J3, J4	CONN., RF/COAX, SMA JACK, FEMALE, 1PORT, VERT, ST, SMT, 50 $\Omega$ , Au	MOLEX, 0732511350
4	2	JP1, JP2	CONN., HDR, MALE, 2 $\times$ 3, 2mm, VERT, ST, THT	WURTH ELEKTRONIK, 62000621121
5	4	MP1-MP4	STANDOFF, NYLON, SNAP-ON, 0.375"	KEYSTONE, 8832
6	2	XJP1, XJP2	CONN., SHUNT, FEMALE, 2-POS, 2mm	WURTH ELEKTRONIK, 60800213421

**SCHEMATIC DIAGRAM**



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**TITLE: SCHEMATIC**  
 18V, 16A MONOLITHIC SYNCHRONOUS STEP-DOWN SILENT SWITCHER 3 WITH LOW NOISE REFERENCE

**IC NO.:** LT8627SP  
**SKU NO.:** DC3147A  
**DATE:** Tuesday, February 15, 2022

**SCHEMATIC NO. AND REVISION:**  
 710-DC3147A\_REV05

**SIZE:** NA  
**SHEET:** 1 OF 1

THIS CIRCUIT IS PROPRIETARY TO ANALOG DEVICES AND SUPPLIED FOR USE WITH ANALOG DEVICES PARTS.

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

## REVISION HISTORY

REV	DATE	DESCRIPTION	PAGE NUMBER
A	4/24	Initial release	—





## 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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