

LTC6362

Fully Differential Amplifier

DESCRIPTION

The LTC[®]6362 is a low power, low noise differential op amp with rail-to-rail input and output swing that has been optimized to drive low power SAR ADCs. The amplifier may be configured to buffer a fully differential input signal or convert a single-ended input signal to a differential output signal. Demo circuit 1833A contains the LTC6362 amplifier configured as a unity gain amplifier with 1k Ω feedback and input resistors, where both inputs are AC-coupled by a 1 μ F capacitor. The differential outputs of the DC1833A can be configured with a first order RC network for driving

the differential inputs of an ADC. The LTC6362 differential output can be DC-coupled or AC-coupled (AC-coupled is the default configuration). Onboard jumpers configure the DC1833A for dual or single power supply. In addition, there are several optional surface mount pads that can be used to change the LTC6362 configuration.

Design files for this circuit board are available at <http://www.linear.com/demo>

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PERFORMANCE SUMMARY

This demo board is factory tested by measuring distortion with an 8V_{P-P}, 2kHz differential input, as given in Table 1. (T_A = 25°C)

Table 1. LTC6362 Noise and Distortion

Differential Input, Referred Noise Voltage Density		3.9nV/ $\sqrt{\text{Hz}}$
Distortion, 8V _{P-P} Differential Input, V _S = 5V, F _{IN} = 2kHz, R _{LOAD} = 1000 Ω	2nd Harmonic	-128dBc
	3rd Harmonic	-114dBc

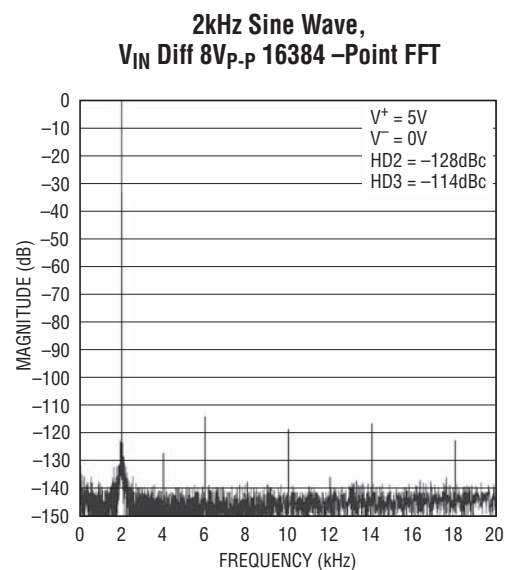
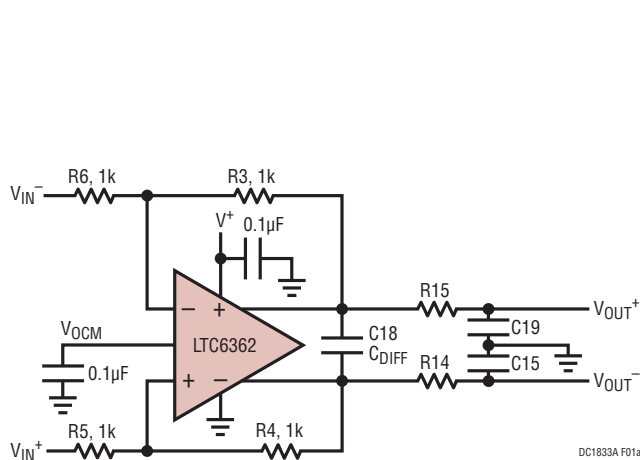


Figure 1. Typical Application for an LTC6362

DEMO MANUAL DC1833A

QUICK START PROCEDURE

Check to ensure that both jumpers, JP1 and JP2, are set as shown in Figure 2. Power the DC1833 from a single power supply, $V^+ = 5V$ and $V^- = 0V$. For distortion measurements, a low noise, low distortion generator and an analyzer such

as Audio Precision SYS-2722 or Stanford Research SR1 should be used with the LTC6362 configured as shown in Figure 1, the resulting distortion for an $8V_{p-p}$ sine wave input is shown in the FFT plot.

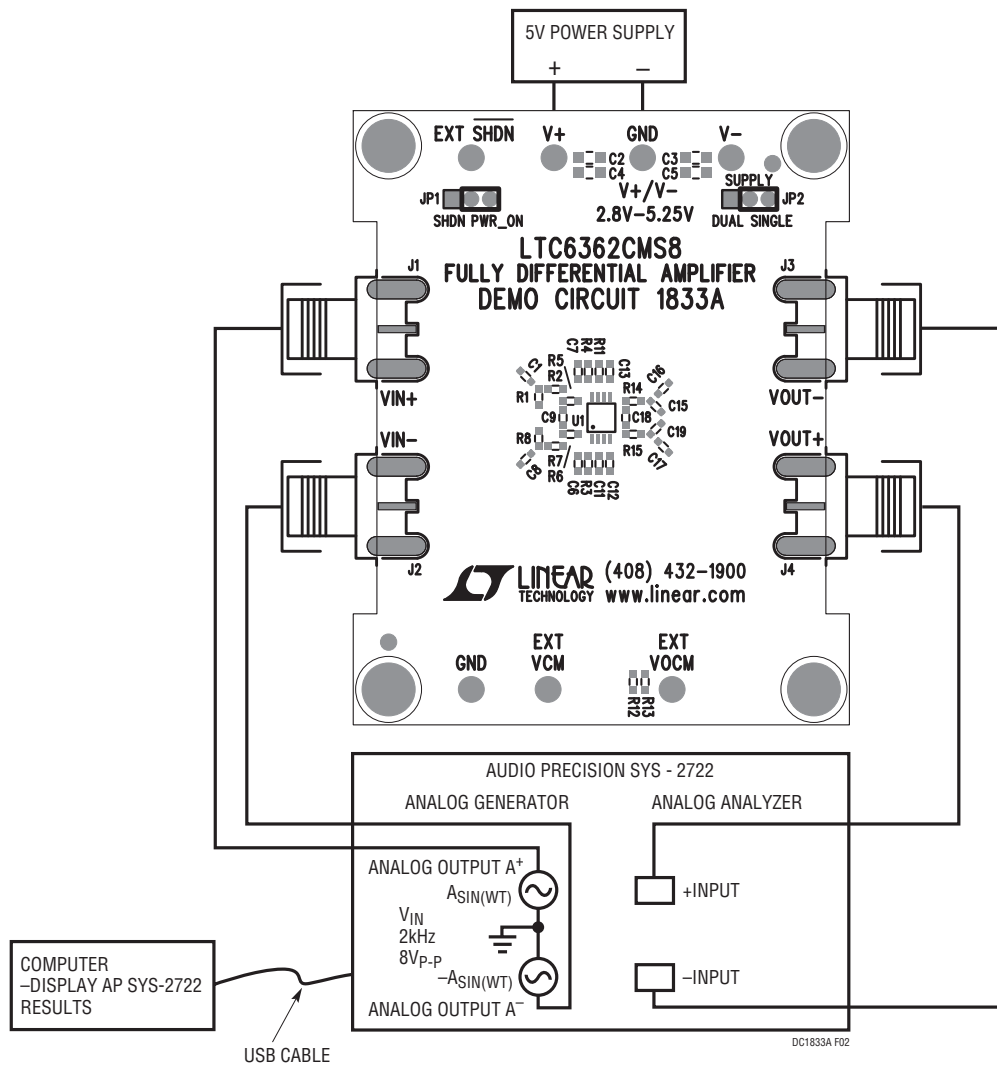


Figure 2. DC1833A Connection Diagram

QUICK START PROCEDURE

Single-Ended to Differential Output

The DC1833A can be configured for single-ended input to differential output by populating R1 with 0Ω , removing C1, and replacing C8 with a 0Ω resistor. In this configuration, the input, J2, is now DC-coupled to the LTC6362 input. The differential output is AC-coupled in the default setting. Driving the single-ended input of the LTC6362 at full scale $10V_{P-P}$, each output will swing from $0.5V$ to $4.5V$ when configured with gain of $A_V = -0.8$ ($A_V = -0.8$ is set by changing the R5 and R6 values to $1.25k$).

Differential Input to Differential Output

Populate C1 and C8 pads with 0Ω resistors to set the differential input mode.

DC-Coupled Output

The DC1833 is configured for an AC-coupled output via C16 and C17. For DC-coupled output, replace these capacitors with 0Ω resistors.

Layout

A ground plane is necessary to obtain maximum performance. Keep bypass capacitors as close to supply pins as possible. Use individual low impedance returns for all bypass capacitors. Use a symmetrical layout around the analog inputs to minimize the effects of parasitic elements. Shield analog input traces with ground to minimize coupling from other traces. Keep traces as short as possible.

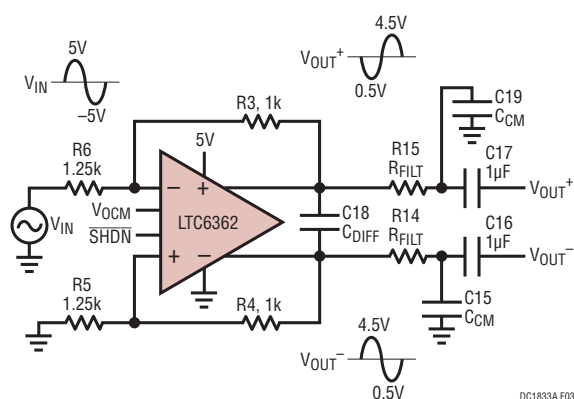


Figure 3. Single-Ended to Differential Output

Definitions

JP1: Toggles the LTC6362 ON and OFF. Part ON is the default setting.

JP2: Toggles between single and dual power supplies for the LTC6362. The single supply is the default configuration for the DC1833A.

E1: Positive Power Supply Voltage. In the default configuration, $V^+ = 5V$.

E2: Ground.

E3: Negative Power Supply Voltage, V^- . In the default configuration V^- is tied to Ground.

E4: Sets the input common mode voltage. In the default the input common mode voltage is set by the output common mode reference voltage. Please refer to the input common mode voltage range section in the LTC6362 data sheet for more details.

E5: The voltage on this pin sets the output common mode voltage level. If left floating (default setting), an internal resistor divider develops a default voltage of $2.5V$ with a $5V$ supply.

E6: Ground.

E7: Externally drives the \overline{SHDN} pin. The default configuration the $\overline{EXT SHDN}$ pin is left floating (LTC6362 power on). Use $\overline{EXT SHDN}$ only after JP1 is removed.

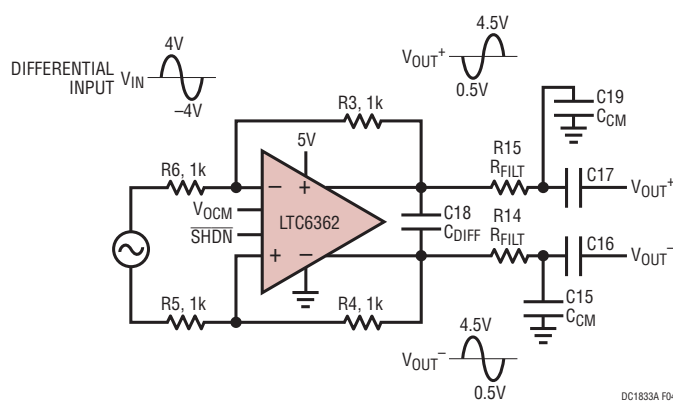


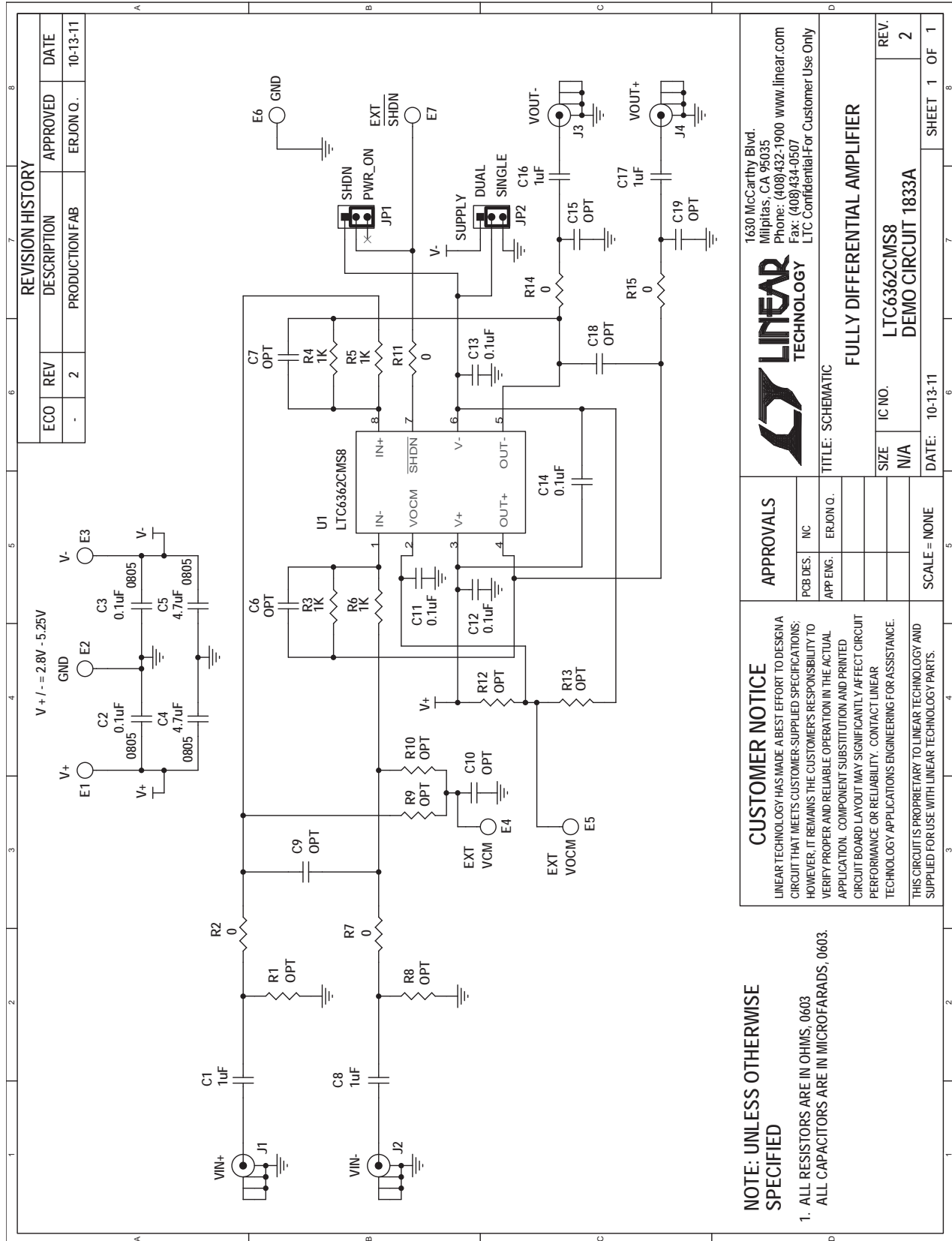
Figure 4. Differential Input to Differential Output

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PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Required Circuit Components				
1	4	C1, C8, C16, C17	CAP, CER X5R 1 μ F 16V, 0603	AVX, 0603YD105KAT
2	2	C2, C3	CAP, CER 0.1 μ F 25V 10% X7R, 0805	MURATA, GRM21BR71E104KA01L
3	2	C4, C5	CAP, CER X5R 4.7 μ F 16V, 0805	TAIYO YUDEN, EMK212ABJ475MG-T
4	0	C6, C7, C9, C10, C15, C18, C19 (OPT)	CAP, 0603	
5	4	C11, C12, C13, C14	CAP, CER X7R 0.1 μ F 16V, 0603	AVX, 0603YC104KAT
6	2	JP1, JP2	HEADER, 3PIN 1 ROW 0.079CC	SAMTEC, TMM-103-02-L-S
7	2	JP1, JP2	SHUNT, 0.079" CENTER	SAMTEC, 2SN-BK-G
8	4	J1 TO J4	CONN SMA 50 Ω EDGE LAUNCH	AMPHENOL/CONNEX 132357
9	7	E1 TO E7	TP, TURRET, 0.064"	MILL-MAX, 2308-2-00-80-00-00-07-0
10	0	R1, R8, R9, R10, R12, R13 (OPT)	RES, 0603	
11	5	R2, R7, R11, R14, R15	RES, CHIP 0, 1%, 0603	NIC, NRC06ZOTRF
12	4	R3, R4, R5, R6	RES, CHIP 1k, 1%, 0603	NIC, NRC06F1001TRF
13	1	U1	IC, FULLY DIFFERENTIAL AMPLIFIER	IC, LINEAR TECH. LTC6362CMS8
14	2		STENCIL FOR BOTH SIDES	STENCIL, DC1833A-2
15	1		FAB, PRINTED CIRCUIT BOARD	DEMO CIRCUIT 1833A-2

SCHEMATIC DIAGRAM



REVISION HISTORY				
ECO	REV	DESCRIPTION	APPROVED	DATE
-	2	PRODUCTION FAB	ERJON O.	10-13-11

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LINEAR TECHNOLOGY

TITLE: SCHEMATIC

FULLY DIFFERENTIAL AMPLIFIER

PCB DES.	NC
APP ENG.	ERJON O.
SIZE	IC NO.
N/A	LTC6362CMS8
DATE:	10-13-11
SCALE = NONE	SHEET 1 OF 1

CUSTOMER NOTICE
LINEAR TECHNOLOGY HAS MADE A BEST EFFORT TO DESIGN A CIRCUIT THAT MEETS CUSTOMER-SUPPLIED SPECIFICATIONS; HOWEVER, IT REMAINS THE CUSTOMER'S RESPONSIBILITY TO VERIFY PROPER AND RELIABLE OPERATION IN THE ACTUAL APPLICATION. COMPONENT SUBSTITUTION AND PRINTED CIRCUIT BOARD LAYOUT MAY SIGNIFICANTLY AFFECT CIRCUIT PERFORMANCE OR RELIABILITY. CONTACT LINEAR TECHNOLOGY APPLICATIONS ENGINEERING FOR ASSISTANCE.

NOTE: UNLESS OTHERWISE SPECIFIED

1. ALL RESISTORS ARE IN OHMS, 0603
ALL CAPACITORS ARE IN MICROFARADS, 0603.

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This notice contains important safety information about temperatures and voltages. For further safety concerns, please contact a LTC application engineer.

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