LT6350CMS8
# Low Noise Single-Ended to Differential Amplifier SAR ADC Driver

## DESCRIPTION

Demonstration Circuit 1538A supports the LT6350, a Low Noise Single Ended to Differential Amplifer / SAR ADC Driver. The LT6350 contains an un-dedicated open-loop "Opamp1", and a dedicated inverting "Opamp2" in a gain of -1. Opamp1 has Rail to Rail inputs and output. Opamp2 has a Rail to Rail ouput. See Figure 1.

**Design files for this circuit board are available. Call the LTC factory.**

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## PERFORMANCE SUMMARY  Specifications are typical at $T_A$ = 25°C, Vs = +/-5V

| SYMBOL | PARAMETER | CONDITIONS, COMMENTS | TYP | UNITS |
|--------|-----------|----------------------|-----|-------|
| $V_S$ | Supply Voltage Range | Single Supply | 2.7V to 12V | V |
| | | Split Supply | +/-1.35V to +/-6V | V |
| Vcm | Input Voltage Range | Op Amp 1 | Rail to Rail | V |
| | | Op Amp 2 | Vs- +1.5V to Vs+ -0.1V | V |
| BW | -3dB Bandwidth | Small signal, differential output | 33 | MHz |
| Vout | Output Voltage Swing | Each output, to either rail, no load | 55 | mV |
| $I_{CC}$ | Supply Current | Vs = +/-5V | 4.8 | mA |

Figure 1. LT6350 Block Diagram .  Opamp1 is an undedicated low noise opamp.  Opamp2 is a dedicated invertor.
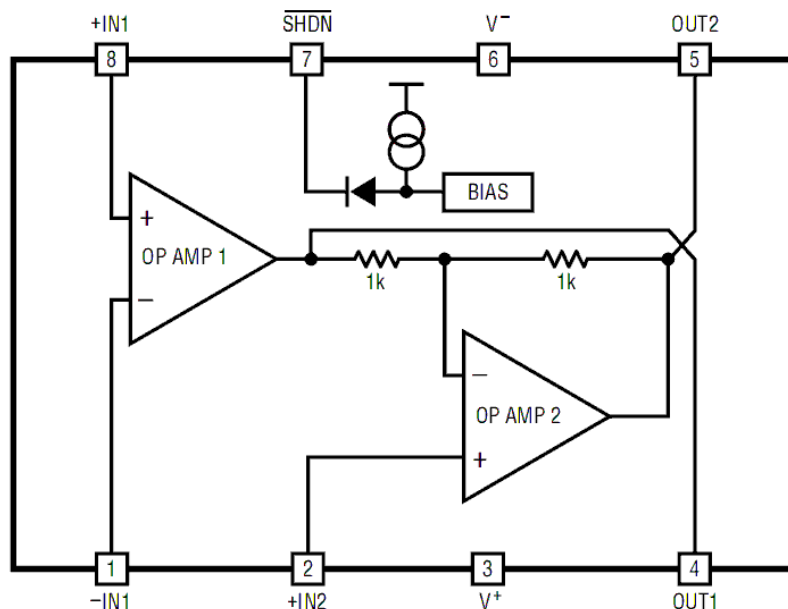
# OPERATING PRINCIPLES

Conversion of single ended signals to differential is a basic function. It may be desired for improved transmission characteristics over twisted pair, or for driving SAR ADCs which prefer differential inputs. The LT6350 makes the single-ended to conversion easy by providing an already connected internal invertor, Opamp2. In the simplest configuration, with Opamp1 in a gain of 1, the conversion to differential causes an effective gain of 2 overall.

# QUICK START PROCEDURE

Demonstration circuit 1538 is shipped with the jumpers set for Single Supply, DC coupled operation, with Opamp1 configured in a gain of 1 (OUT1 shorted to –IN1). As the intended application is for single ended inputs, only one input BNC connector is installed (J1) and this is the exciatation path for Opamp1's non-inverting input +IN1. To support Opamp1 in inverting or other applications, a footprint for another BNC was included (J3) for user installation.
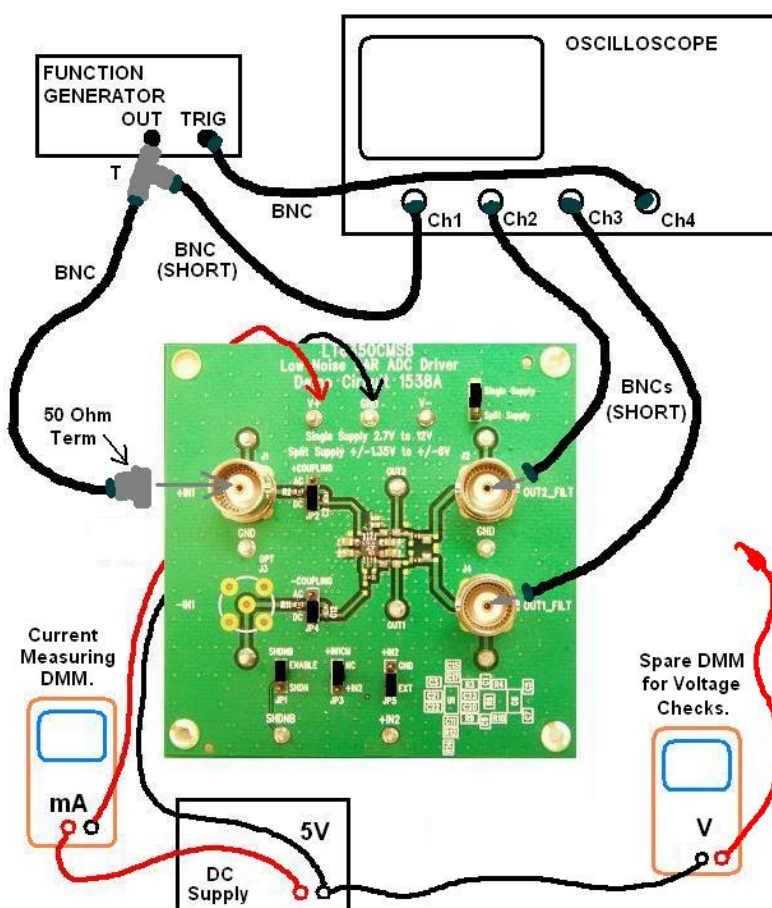


**Figure 2. Proper Connections for Single Supply Operation (DMMs optional). The function generator should be set up to operate around a positive 2V DC offset. For split supply operation, set JP6 to "Split Supply" and connect a negative supply to the V- turret.**
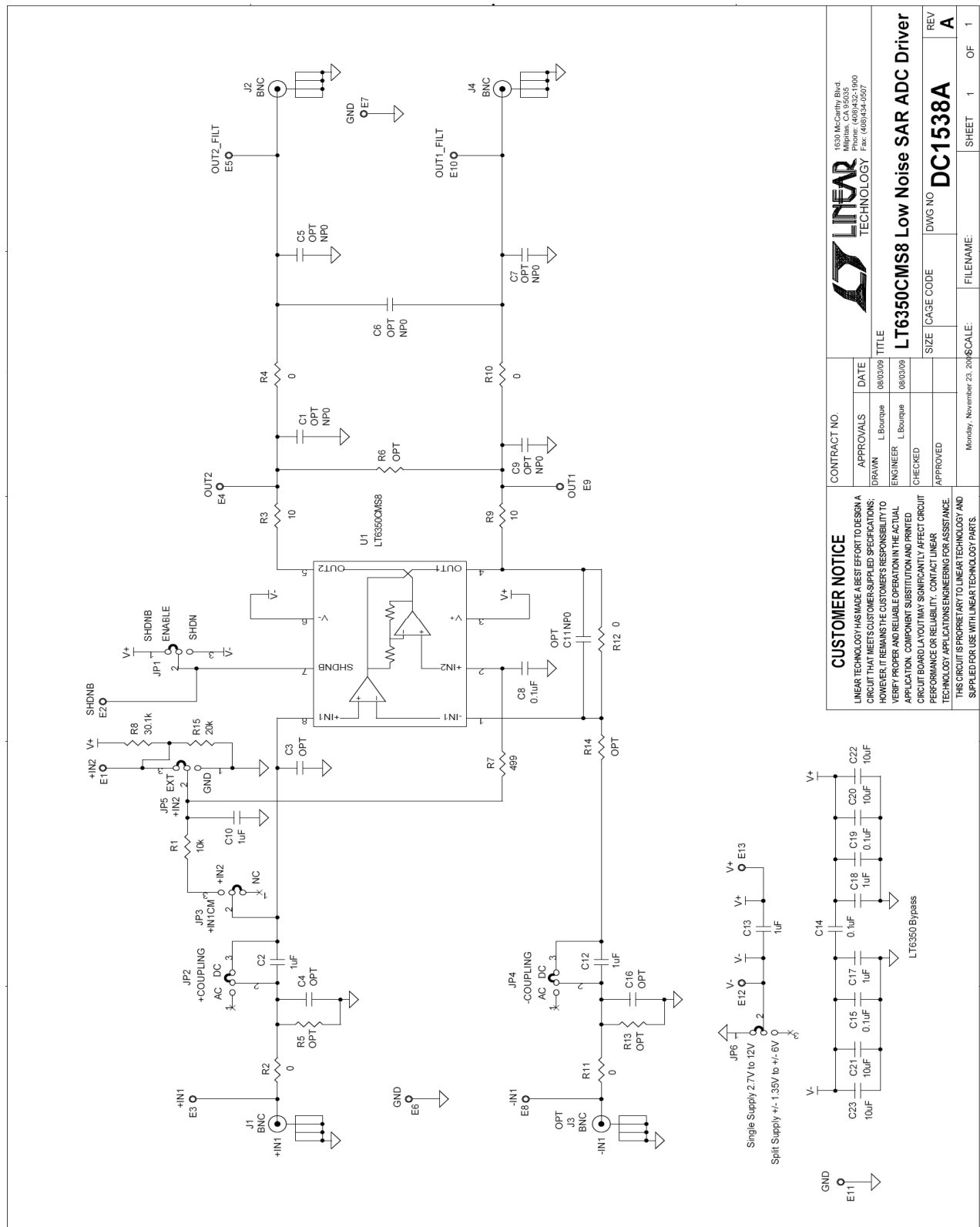
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**Figure 3. Circuit Schematic**

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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.

THIS CIRCUIT IS PROPRIETARY TO LINEAR TECHNOLOGY AND SUPPLIED FOR USE WITH LINEAR TECHNOLOGY PARTS.

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TITLE
LT6350CMS8 Low Noise SAR ADC Driver

SIZE | CAGE CODE | DWG NO | REV
| | DC1538A | A

SCALE: | SHEET 1 OF 1

Monday, November 23, 2009

| Item | Qty | Ref - Des | Part Description | Manufacturer, Part # |
|------|-----|-----------|------------------|----------------------|
| | | | | |
| | | **REQUIRED CIRCUIT COMPONENTS:** | | |
| 1 | 6 | C2,C10,C12,C13,C17,C18 | CAP., X7R, 1uF, 16V, 10% 0603 | AVX, 0603YC105KAT2A |
| 2 | 4 | C8,C14,C15,C19 | CAP., X7R, 0.1uF, 25V, 10% 0603 | AVX, 06033C104KAT2A |
| 3 | 4 | C20,C21,C22,C23 | CAP., X5R,10uF, 16V, 10% 0805 | MURATA,GRM21BR61C106KE15L |
| 4 | 1 | R1 | RES., CHIP, 10K, 1/10W, 1% 0603 | VISHAY, CRCW060310K0FKEA |
| 5 | 5 | R2,R4,R10,R11,R12 | RES., CHIP, 0, 1/10W, 0603 | VISHAY, CRCW06030000Z0EA |
| 6 | 2 | R3,R9 | RES., CHIP, 10, 1/10W, 1% 0603 | VISHAY, CRCW060310R0FKEA |
| 7 | 1 | R7 | RES., CHIP, 499, 1/10W, 1% 0603 | VISHAY, CRCW0603499RFKEA |
| 8 | 1 | R8 | RES., CHIP, 30.1K, 1/10W, 1% 0603 | VISHAY, CRCW060330K1FKEA |
| 9 | 1 | R15 | RES., CHIP, 20K, 1/10W, 1% 0603 | VISHAY, CRCW060320K0FKEA |
| 10 | 1 | U1 | Low Noise SAR ADC Driver | Linear Tech., LT6350CMS8#TRPBF |
| | | **ADDITIONAL DEMO BOARD CIRCUIT COMPONENTS:** | | |
| 1 | 5 | C1,C5,C7,C9,C11 (opt.) | CAP., 0603, NP0 | |
| 2 | 1 | C3 (opt.) | CAP., 0603 | |
| 3 | 3 | C4,C6,C16 (opt.) | CAP., 1206, NP0 | |
| 4 | 2 | R5,R13 (opt.) | RES., 1206 | |
| 5 | 2 | R6,R14 (opt.) | RES., 0603 | |
| | | **HARDWARE** | | |
| 1 | 13 | E1-E13 | TESTPOINT, TURRET, .065" pbf | MILL-MAX, 2308-2-00-80-00-00-07-0 |
| 2 | 4 | J1,J2,J3,J4 | CONN, BNC, 5 PINS | CONNEX, 112404 |
| 3 | 6 | JP1,JP2,JP3,JP4,JP5,JP6 | HEADER, 3PINS, 2mm | SAMTEC, TMM-103-02-L-S |
| 4 | 6 | JP1,JP2,JP3,JP4,JP5,JP6 | SHUNT, 2MM CENTER | SAMTEC, 2SN-BK-G |
| 5 | 4 | MH1,MH2,MH3,MH4 | STAND-OFF, NYLON 0.25" | KEYSTONE, 8831(SNAP ON) |

**Figure 4. Bill of Materials**

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