Dual Precision Instrumentation Switched-Capacitor Building Block

FEATURES

- Instrumentation Front End with 120dB CMRR
- Precise, Charge-Balanced Switching
- Operates from 3V to 18V
- Internal or External Clock
- Operates up to 5MHz Clock Rate
- Low Power
- Two Independent Sections with One Clock

APPLICATIONS

- Precision Instrumentation Amplifiers
- Ultra Precision Voltage Inverters, Multipliers and Dividers
- V–F and F–V Converters
- Sample and Hold
- Switched-Capacitor Filters

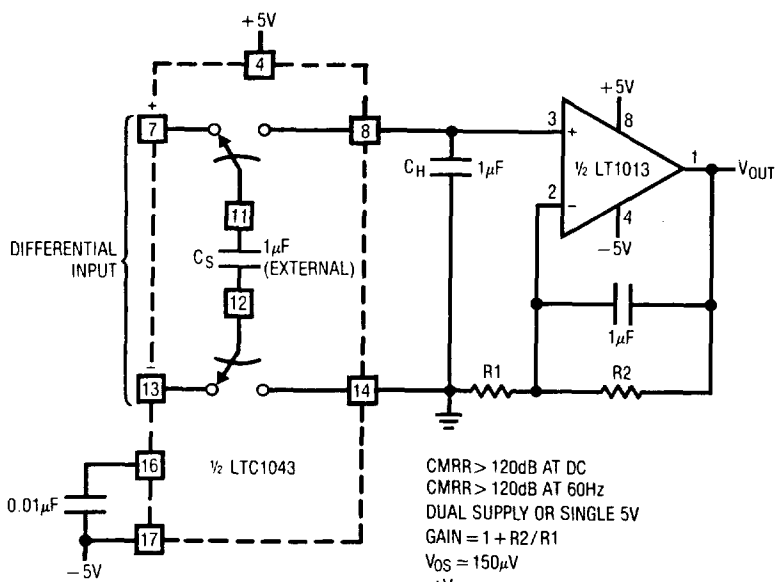
DESCRIPTION

The LTC1043 is a monolithic, charge-balanced, dual switched-capacitor instrumentation building block. A pair of switches alternately connects an external capacitor to an input voltage and then connects the charged capacitor across an output port. The internal switches have a break-before-make action. An internal clock is provided and its frequency can be adjusted with an external capacitor. The LTC1043 can also be driven with an external CMOS clock.

The LTC1043, when used with low clock frequencies, provides ultra precision DC functions without requiring precise external components. Such functions are differential voltage to single-ended conversion, voltage inversion, voltage multiplication and division by 2, 3, 4, 5, etc. The LTC1043 can also be used for precise V–F and F–V circuits without trimming, and it is also a building block for switched-capacitor filters, oscillators and modulators.

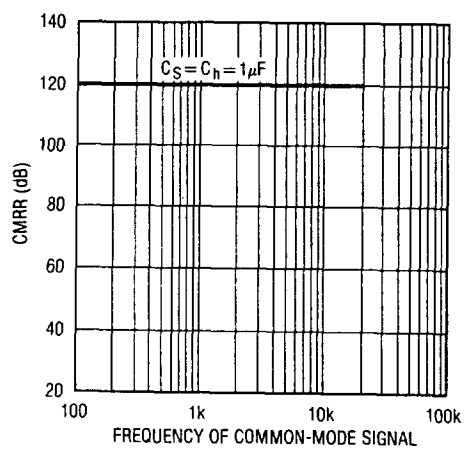
The LTC1043 is manufactured using Linear Technology's enhanced LTCMOS™ silicon gate process.

Instrumentation Amplifier



CMRR > 120dB AT DC
CMRR > 120dB AT 60Hz
DUAL SUPPLY OR SINGLE 5V
GAIN = 1 + R2/R1
V_{OS} = 150μV
$\frac{\Delta V_{OS}}{\Delta T}$ = 2μV/°C
COMMON-MODE INPUT VOLTAGE INCLUDES THE SUPPLIES

CMRR vs Frequency



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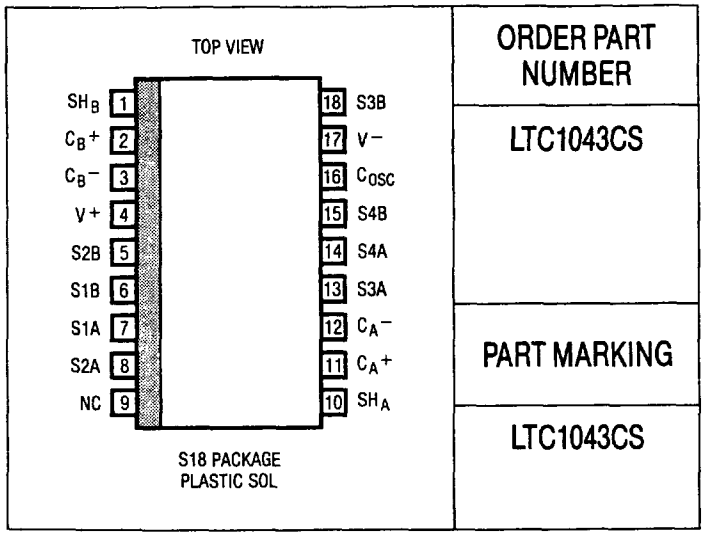
ABSOLUTE MAXIMUM RATINGS

Supply Voltage 18V
Input Voltage
at Any Pin ..... $-0.3V \leq V_{IN} \leq V^+ + 0.3V$
Operating Temperature Range..... $-40°C \leq T_A \leq 85°C$
Storage Temperature Range..... $-65°C$ to $150°C$
Lead Temperature (Soldering, 10 sec.)..... $300°C$

PACKAGE/ORDER INFORMATION



ORDER PART NUMBER
LTC1043CS
PART MARKING
LTC1043CS

ELECTRICAL CHARACTERISTICS

$V^+ = 10V$, $V^- = 0V$, $T_A = 25°C$ unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS		LTC1043C MIN	TYP	MAX	UNITS
I_S	Power Supply Current	Pin 16 Connected High or Low			0.25	0.4	mA
			●			0.7	mA
		C_{OSC} (Pin 16 to V^-) = 100pF			0.4	0.65	mA
			●			1	mA
I_I	OFF Leakage Current	Any Switch, Test Circuit 1 (Note 1)			6	100	pA
			●		6		nA
R_{ON}	ON Resistance	Test Circuit 2, $V_{IN} = 7V$, $I = \pm 0.5mA$			240	400	Ω
		$V^+ = 10V$, $V^- = 0V$	●			700	Ω
R_{ON}	ON Resistance	Test Circuit 2, $V_{IN} = 3.1V$, $I = \pm 0.5mA$			400	700	Ω
		$V^+ = 5V$, $V^- = 0V$	●			1	kΩ
f_{OSC}	Internal Oscillator Frequency	C_{OSC} (Pin 16 to V^-) = 0pF			185		kHz
		C_{OSC} (Pin 16 to V^-) = 100pF		20	34	50	kHz
		Test Circuit 3	●	15		75	kHz
I_{OSC}	Pin Source or Sink Current	Pin 16 at V^+ or V^-			40	70	μA
			●			100	μA
	Break-Before-Make-Time				25		ns
	Clock to Switching Delay	C_{OSC} Pin Externally Driven			75		ns
f_M	Maximum External CLK Frequency	C_{OSC} Pin Externally Driven with CMOS Levels			5		MHz
CMRR	Common-Mode Rejection Ratio	$V^+ = 5V$, $V^- = -5V$, $-5V < V_{CM} < 5V$, DC to 400Hz			120		dB

The ● denotes specifications which apply over the full operating temperature range. LTC1043 operates from $-40°C \leq T_A \leq 85°C$.

Note 1: OFF leakage current is guaranteed but not tested at 25°C.