

FEATURES

- Micropower Operation
- Single 5V or $\pm 15\text{V}$ Supply Operation
- Low Charge Injection
- Low R_{ON}
- Low Leakage
- Guaranteed Break Before Make
- Latch Resistant Design
- TTL/CMOS Compatible
- Improved Second Source for DG201A/DG202

KEY SPECIFICATIONS

- | | |
|------------------------|--------------------------------------|
| ■ Supply Current | $I^+ = 40\mu A$, $I^- = 5\mu A$ Max |
| ■ Charge Injection | |
| ±15V Supplies | ±25pC Max |
| Single 5V Supply | 2pC Typ |
| ■ R_{ON} | 65Ω Typ |
| ■ Signal Range | ±15V |

DESCRIPTION

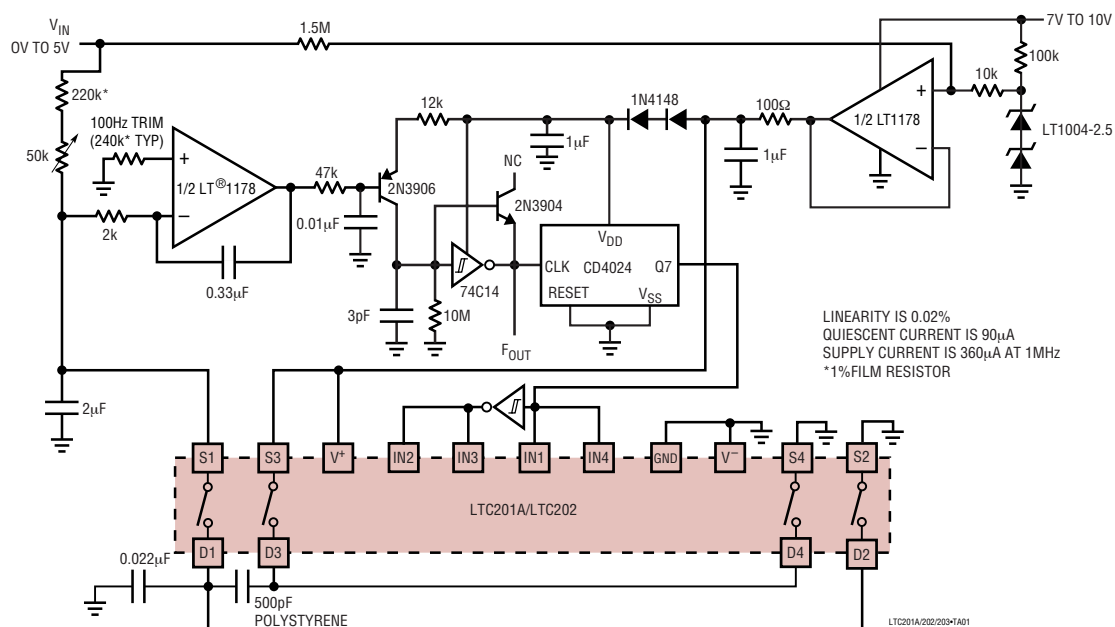
The LTC®201A, LTC202, and LTC203 are micropower, quad CMOS analog switches which typically dissipate only 250µW from ±15V supplies and 40µW from a single 5V supply. The switches have 65Ω typical on resistance and a very high off resistance. A break-before-make characteristic, inherent in these switches, prevents the shorting of two channels. With a supply voltage of ±15V, the signal range is ±15V. These switches have special charge compensation circuitry which greatly reduces charge injection to a maximum of ±25pC (±15V supplies).

The LTC201A, LTC202, and LTC203 are designed for applications such as programmable gain amplifiers, analog multiplexers, sample-and-hold circuits, precision charge switching and remote switching. These three devices are differentiated by the type of switch action, as shown in the logic table.

 LTC and LT are registered trademarks of Linear Technology Corporation.

TYPICAL APPLICATION

Micropower 100Hz to 1MHz V-to-F Converter



LTC201A/LTC202/LTC203

ABSOLUTE MAXIMUM RATINGS

(Note 1)

Voltages Referenced to V^-

V^+	44V
GND	25V
Digital Inputs, S, D (Note 2)	-2V to ($V^+ + 2V$) or 20mA, Whichever Occurs First

Current

Any Input Except S or D	30mA
Continuous S or D	20mA
Peak S or D (Pulsed at 1ms, 10% Duty Cycle Max)	70mA

ESD Susceptibility (Note 3) 4kV

Power Dissipation (Plastic) 500mW

Power Dissipation (Ceramic) 900mW

Operating Temperature Range

LTC201AC/LTC202C/LTC203C 0°C to 70°C

LTC201AM/LTC202M/LTC203M -55°C to 125°C

Storage Temperature Range -65°C to 150°C

Lead Temperature (Soldering, 10 sec) 300°C

LOGIC TABLE

IN_X	LTC201A IN1 TO IN4	LTC202 IN1 TO IN4	LTC203	
			IN1, IN4	IN2, IN3
0	ON	OFF	OFF	ON
1	OFF	ON	ON	OFF

PACKAGE/ORDER INFORMATION

TOP VIEW N PACKAGE 16-LEAD PDIP $T_{JMAX} = 110^{\circ}\text{C}$, $\theta_{JA} = 120\text{C/W}$ S PACKAGE 16-LEAD PLASTIC SO $T_{JMAX} = 110^{\circ}\text{C}$, $\theta_{JA} = 130\text{C/W}$ J PACKAGE 16-LEAD CERDIP $T_{JMAX} = 150^{\circ}\text{C}$, $\theta_{JA} = 100\text{C/W}$	ORDER PART NUMBER
	LTC201ACN LTC201ACS LTC202CN LTC202CS LTC203CN LTC203CS
	ORDER PART NUMBER
	LTC201AMJ LTC201ACJ LTC202MJ LTC202CJ LTC203MJ LTC203CJ

OBSELETE PACKAGE

Consider the N16 or SO-16 Package for Alternate Source

Consult LTC Marketing for parts specified with wider operating temperature ranges.

DIGITAL AND DC ELECTRICAL CHARACTERISTICS

The ● denotes the specifications which apply over full operating temperature range, otherwise specifications are at $T_A = 25^{\circ}\text{C}$. $V^+ = 15\text{V}$, $V^- = -15\text{V}$, GND = 0V.

PARAMETER	CONDITIONS			LTC201AM/LTC202M/ LTC203M			LTC201AC/LTC202C/ LTC203C			UNITS
				MIN	TYP	MAX	MIN	TYP	MAX	
Analog Signal Range			●			±15			±15	V
R_{ON}	$V_S = \pm 10\text{V}$ $I_D = 1\text{mA}$	T_{MIN}				110			125	Ω
		25°C			65	110		65	125	Ω
		T_{MAX}				160			160	Ω
ΔR_{ON} vs V_S					20			20		%
ΔR_{ON} vs Temperature					0.5			0.5		%/°C
R_{ON} Match	$V_S = 0\text{V}$, $I_{DS} = 1\text{mA}$				5			5		%
Off Input Leakage I_S (OFF)	$V_D = \pm 14\text{V}$, $V_S = \pm 14\text{V}$ Switch Off		●		0.01	±1 ±100		0.01	±5 ±100	nA nA

DIGITAL AND DC ELECTRICAL CHARACTERISTICS

The ● denotes the specifications which apply over full operating temperature range, otherwise specifications are at $T_A = 25^\circ\text{C}$. $V^+ = 15\text{V}$, $V^- = -15\text{V}$, $\text{GND} = 0\text{V}$.

PARAMETER	CONDITIONS		LTC201AM/LTC202M/ LTC203M			LTC201AC/LTC202C/ LTC203C			UNITS
			MIN	TYP	MAX	MIN	TYP	MAX	
Off Output Leakage I_D (OFF)	$V_D = \pm 14\text{V}$, $V_S = \pm 14\text{V}$ Switch Off	●		0.01	± 1 ± 100		0.01	± 5 ± 100	nA nA
On Channel Leakage I_D (ON)	$V_D = V_S = \pm 14\text{V}$ Switch On			0.02	± 1		0.02	± 5	nA
		●			± 200			± 200	nA
Input High Voltage V_{INH}		●	2.4			2.4			V
Input Low Voltage V_{INL}		●			0.8			0.8	V
Input High or Low Current I_{INH} and I_{INL}	$V_{IN} = 15\text{V}$, 0V	●			± 1			± 1	μA
C_S (OFF)				5			5		pF
C_D (OFF)				12			12		pF
C_D , C_S (ON)				30			30		pF
I^+	All Logic Inputs Tied Together $V_{IN} = 0\text{V}$ or 4.0V		16		40	16		40	μA
		●			60			60	μA
I^-				0.1	5		0.1	5	μA
		●			10			10	μA

AC ELECTRICAL CHARACTERISTICS

$V^+ = 15\text{V}$, $V^- = -15\text{V}$, $\text{GND} = 0\text{V}$ unless otherwise noted.

PARAMETER	CONDITIONS		LTC201AM/LTC202M/ LTC203M			LTC201AC/LTC202C/ LTC203C			UNITS
			MIN	TYP	MAX	MIN	TYP	MAX	
t_{ON}	$V_S = 2\text{V}$, $R_L = 1\text{k}\Omega$, $C_L = 35\text{pF}$			290	400		290	400	ns
t_{OFF}				210	300		210	300	ns
t_{OPEN}			20	85		20	85		ns
Off Isolation	$V_S = 2V_{P-P}$, $R_L = 1\text{k}\Omega$, $f = 100\text{kHz}$			75			75		dB
Crosstalk				90			90		dB
Charge Injection O_{INJ}	$R_S = 0\Omega$, $C_L = 1000\text{pF}$, $V_S = 0\text{V}$			5	± 25		8	± 25	pC
Total Harmonic Distortion THD	$V_S = 2V_{P-P}$, $R_L = 10\text{k}\Omega$			0.01			0.01		%

LTC201A/LTC202/LTC203

DIGITAL AND DC ELECTRICAL CHARACTERISTICS

The ● denotes the specifications which apply over full operating temperature range, otherwise specifications are at $T_A = 25^\circ\text{C}$. $V^+ = 5\text{V}$, $V^- = \text{GND} = 0\text{V}$ unless otherwise noted.

PARAMETER	CONDITIONS		LTC201AM/LTC202M/ LTC203M			LTC201AC/LTC202C/ LTC203C			UNITS
			MIN	TYP	MAX	MIN	TYP	MAX	
Analog Signal Range		●	0		5	0		5	V
R_{ON}	$V_S = \pm 1.5\text{V}, +3\text{V}$ $I_D = 0.25\text{mA}$	T_{MIN}			450			520	Ω
		25°C		280	450		280	525	Ω
		T_{MAX}			650			650	Ω
ΔR_{ON} vs V_S				20			20		%
ΔR_{ON} vs Temperature				0.5			0.5		%/ $^\circ\text{C}$
ΔR_{ON} Match	$V_S = 2.5\text{V}, I_{DS} = 0.25\text{mA}$			5			5		%
Off Input Leakage I_S (OFF)	$V_D = 4\text{V}, 1\text{V}; V_S = 1\text{V}, 4\text{V}$ (Note 4) Switch Off			0.01	± 1		0.01	± 5	nA
		●			± 100			± 100	nA
Off Output Leakage I_D (OFF)	$V_D = 4\text{V}, 1\text{V}; V_S = 1\text{V}, 4\text{V}$ (Note 4) Switch Off			0.01	± 1		0.01	± 5	nA
		●			± 100			± 100	nA
On Channel Leakage I_D (ON)	$V_D = V_S = 1\text{V}, 4\text{V}$ (Note 4) Switch On			0.01	± 1		0.01	± 5	nA
		●			± 200			± 200	nA
Input High Voltage V_{INH}		●	2.4			2.4			V
Input Low Voltage V_{INL}		●			0.8			0.8	V
Input High or Low Current I_{INH} and I_{INL}	$V_{IN} = 5\text{V}, 0\text{V}$	●			± 1			± 1	μA
C_S (OFF)				5			5		pF
C_D (OFF)				12			12		pF
C_D, C_S (ON)				30			30		pF
I^+	All Logic Inputs Tied Together $V_{IN} = 0\text{V}$ OR 4.0V			8	20		8	20	μA
		●			30			30	μA

AC ELECTRICAL CHARACTERISTICS

$V^+ = 5\text{V}$, $V^- = \text{GND} = 0\text{V}$ unless otherwise noted.

PARAMETER	CONDITIONS	LTC201AM/LTC202M/ LTC203M			LTC201AC/LTC202C/ LTC203C			UNITS
		MIN	TYP	MAX	MIN	TYP	MAX	
t_{ON}	$V_S = 2\text{V}, R_L = 1\text{k}\Omega, C_L = 35\text{pF}$		450	600		450	600	ns
t_{OFF}			190	300		190	300	ns
t_{OPEN}		100	250		100	250		ns
Off Isolation	$V_S = 2V_{P-P}, R_L = 1\text{k}\Omega, f = 100\text{Hz}$		75			75		dB
Crosstalk			90			90		dB
Charge Injection Q_{INJ}	$R_S = 0\Omega, C_L = 1000\text{pF}, V_S = 2.5\text{V}$		2			2		pC
Total Harmonic Distortion THD	$V_S = 2V_{P-P}, R_L = 10\text{k}\Omega$		0.01			0.01		%

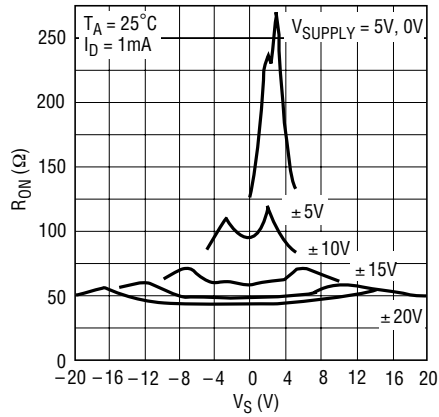
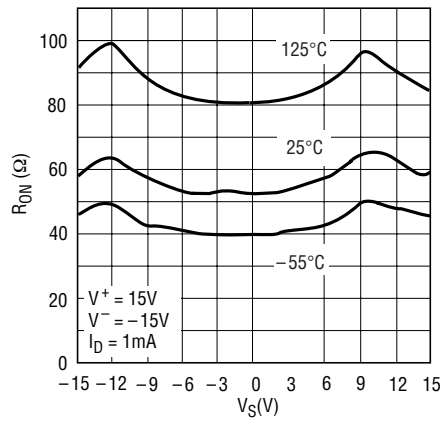
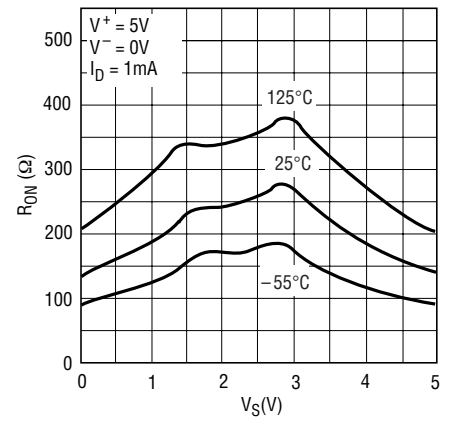
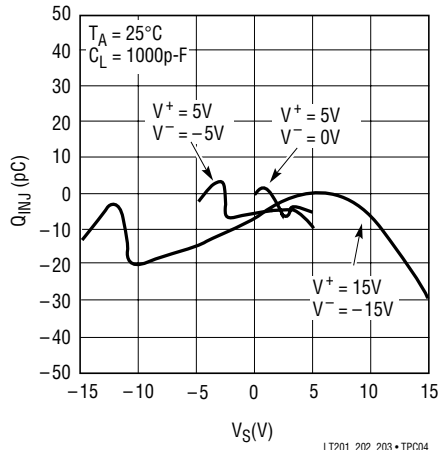
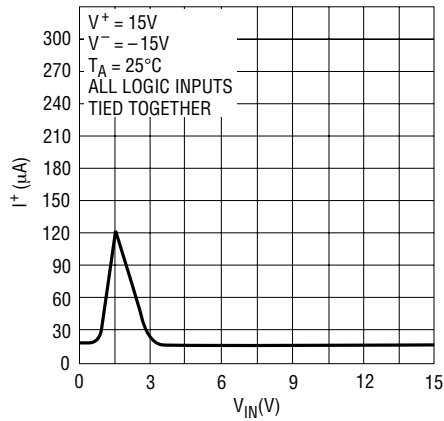
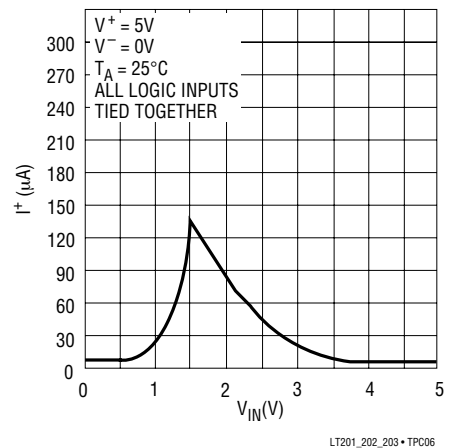
Note 1: Absolute Maximum Ratings are those values beyond which the life of a device may be impaired.

Note 2: Signals on S, D, or IN exceeding V^+ or V^- will be clamped by internal diodes. Limit forward diode current to maximum current rating.

Note 3: In-circuit ESD on the switch pins (S or D) exceeds 4kV (see test circuit).

Note 4: Leakage current with a single 5V supply is guaranteed by correlation with the $\pm 15\text{V}$ leakage current.

TYPICAL PERFORMANCE CHARACTERISTICS

 R_{ON} vs V_S Over Supply Voltage **R_{ON} vs V_S Over Temperature** **R_{ON} vs V_S Over Temperature** **Q_{INJ} vs V_S Over Supply Voltage****Positive Supply Current vs Logic Input Voltage****Supply Current vs Logic Input Voltage**

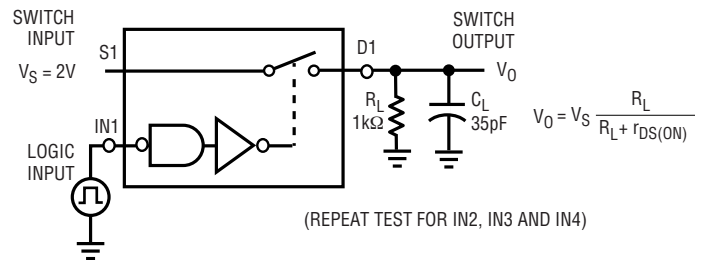
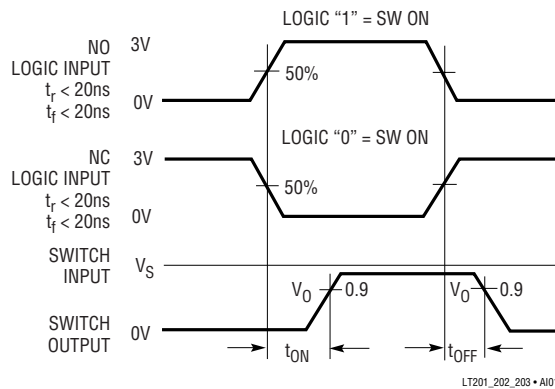
APPLICATIONS INFORMATION

Switching Time Test Circuit

Switch output waveform shown for $V_S = \text{constant}$ with logic input waveform as shown. Note that V_S may be + or – as per switching time test circuit. V_O is the steady state

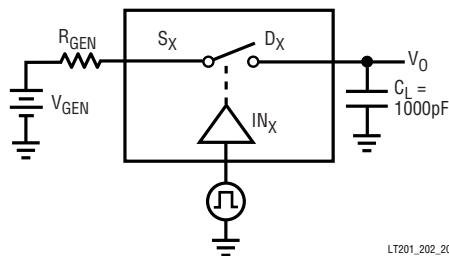
output switch on. Feedthrough via gate capacitance may result in spikes at leading and trailing edge of output waveform.

Switching Time Test Circuit

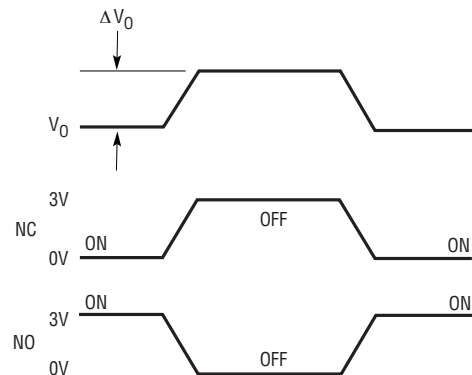


LT201_202_203 • A102

Charge Injection Test Circuit



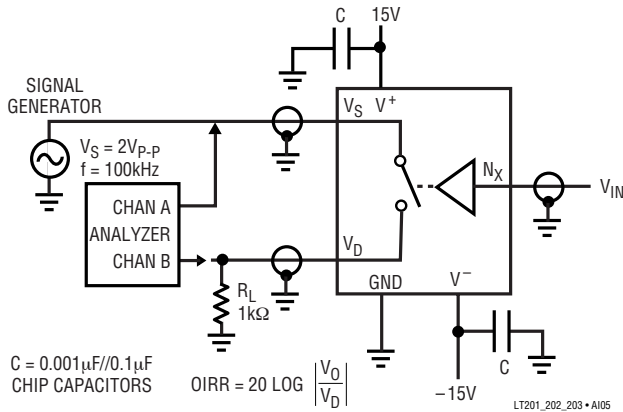
LT201_202_203 • A103



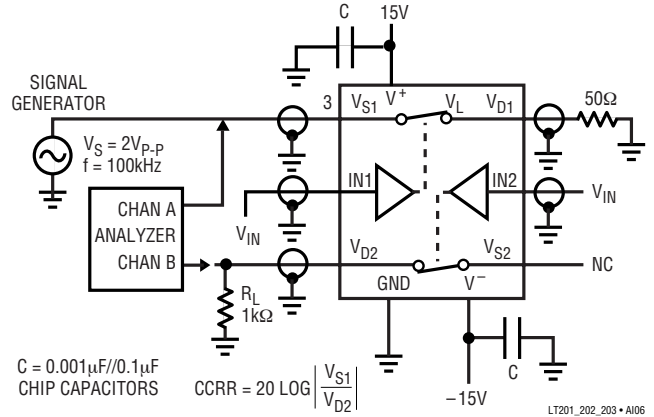
ΔV_O IS THE MEASURED VOLTAGE ERROR DUE TO CHARGE INJECTION.
THE ERROR VOLTAGE IN COULOMBS IS $\Delta Q = C_L \cdot \Delta V_O$

LT201_202_203 • A104

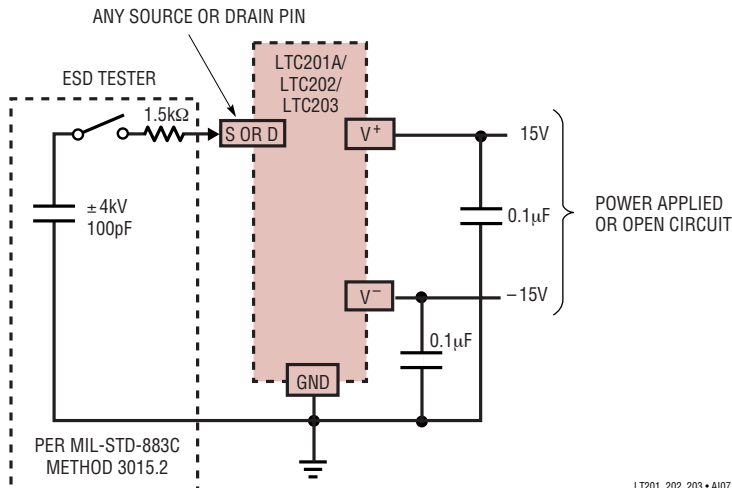
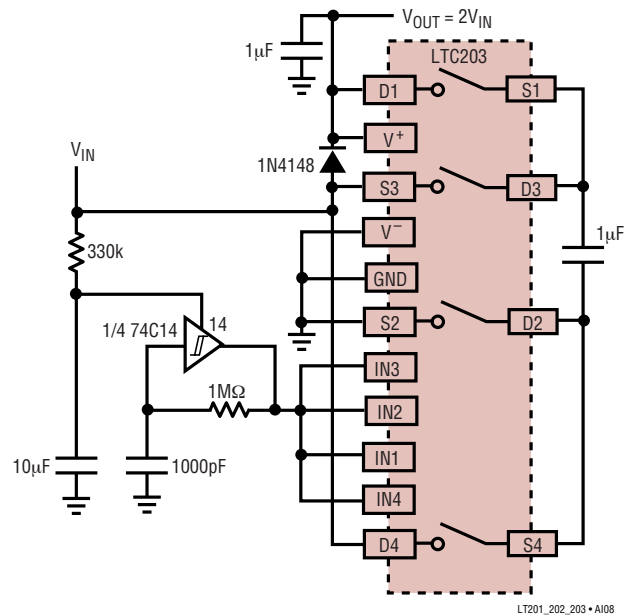
APPLICATIONS INFORMATION

OIRR-Off Isolation Test Circuit


V_{IN}	
3V	NC
0V	NO

CCRR-Channel to Channel Crosstalk Test Circuit


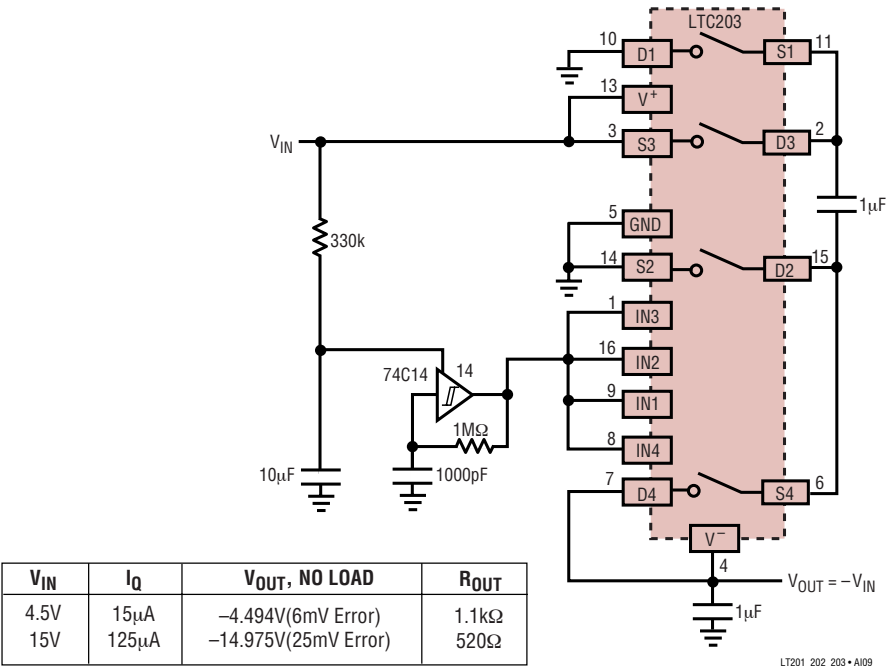
V_{IN}	
3V	NC
0V	NO

In-Circuit ESD Test Circuit

**Micropower, 4.5V to 15V Input,
Voltage Doubler Using the LTC203**


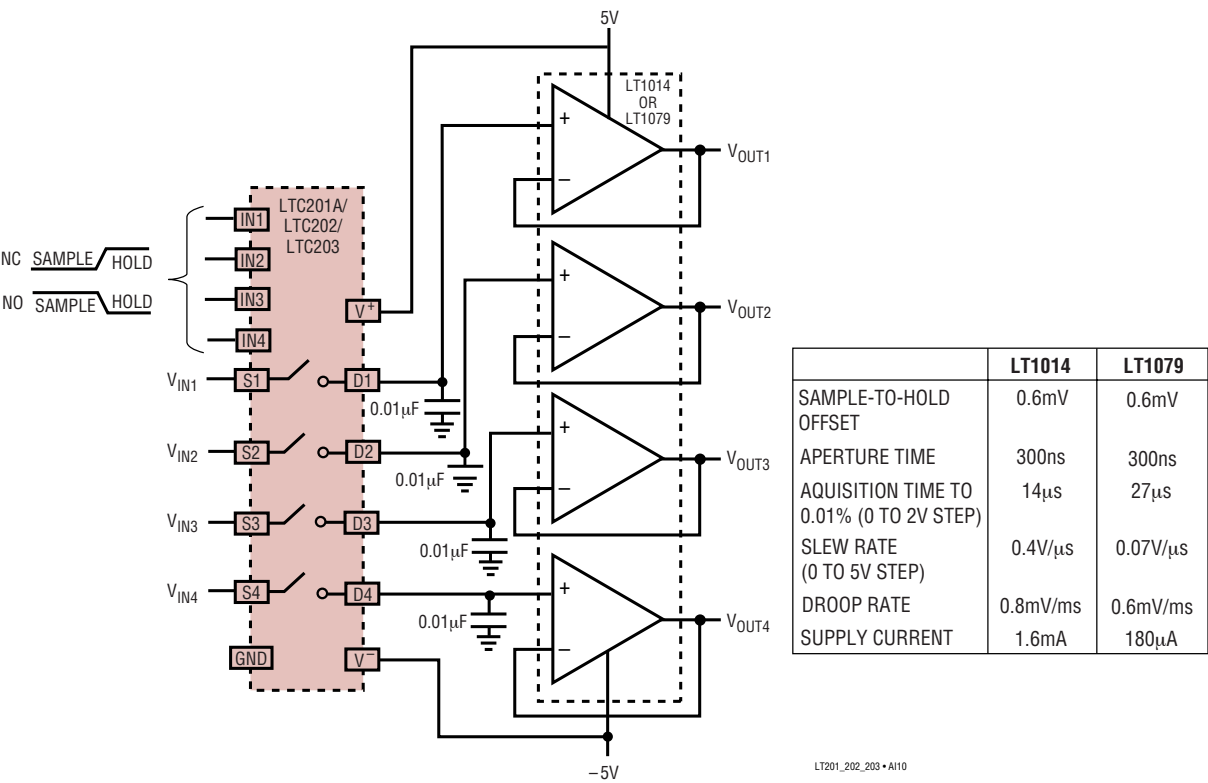
V_{IN}	I_Q	V_{OUT} , NO LOAD	R_{OUT}
4.5V	20μA	8.988V(12mV Error)	1.2k
15V	130μA	29.96V(40mV Error)	600Ω

APPLICATIONS INFORMATION

Micropower, ±4.5V to ±15V, Voltage Inverter Using the LTC203



Quad 12-Bit Sample-and-Hold



[illegible]

The graph displays a noisy signal over time. The vertical axis represents voltage, with a scale bar indicating 50 nV. The horizontal axis represents time, with a scale bar indicating 10 seconds. The signal is a high-frequency, low-amplitude noise centered around a baseline.

9

6V

TYPE K THERMOCOUPLE

“A”

100k

6V

0.02μF

6V

10k

1M

Q2 2N3906

C1 100pF

74C14

6V

100k

C4 300pF

Q1 2N3904

NC

OUTPUT 0°C to 100°C D.C. to 1kHz

6V

LT1025

+V

GND

K

R-

6.81kΩ**

C3 0.47μF

100°C 1.5kΩ TRIM

240k

6V

6.8μF

LT1004-1.2V

3

14

1

16

9

8

11

6

S1

S2

IN1

IN2

IN3

IN4

S3

S4

LTC203

D1

D2

NC

V+

V-

GND

D3

D4

2

15

12

13

4

5

10

7

6V

C2 390pF*

NOTES:

* POLYSTYRENE

** IRC/TRW MTR/5/+ 120ppm

360μA OPERATING CURRENT

4.75V TO 10V SUPPLY VOLTAGE

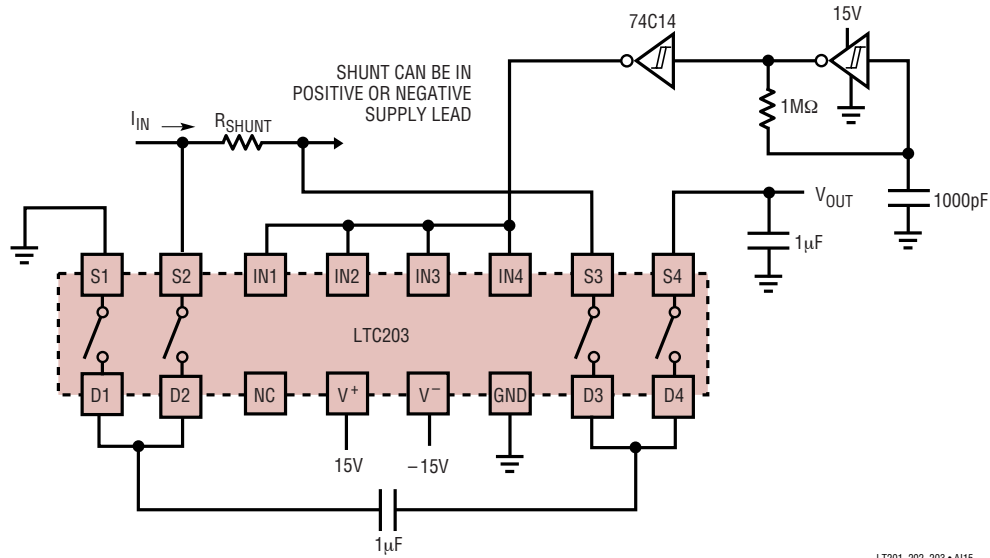
FOR 4mV FULL SCALE “GENERAL PURPOSE”

V → F DELETE LT1025 AND THERMOCOUPLE AND DRIVE POINT “A”

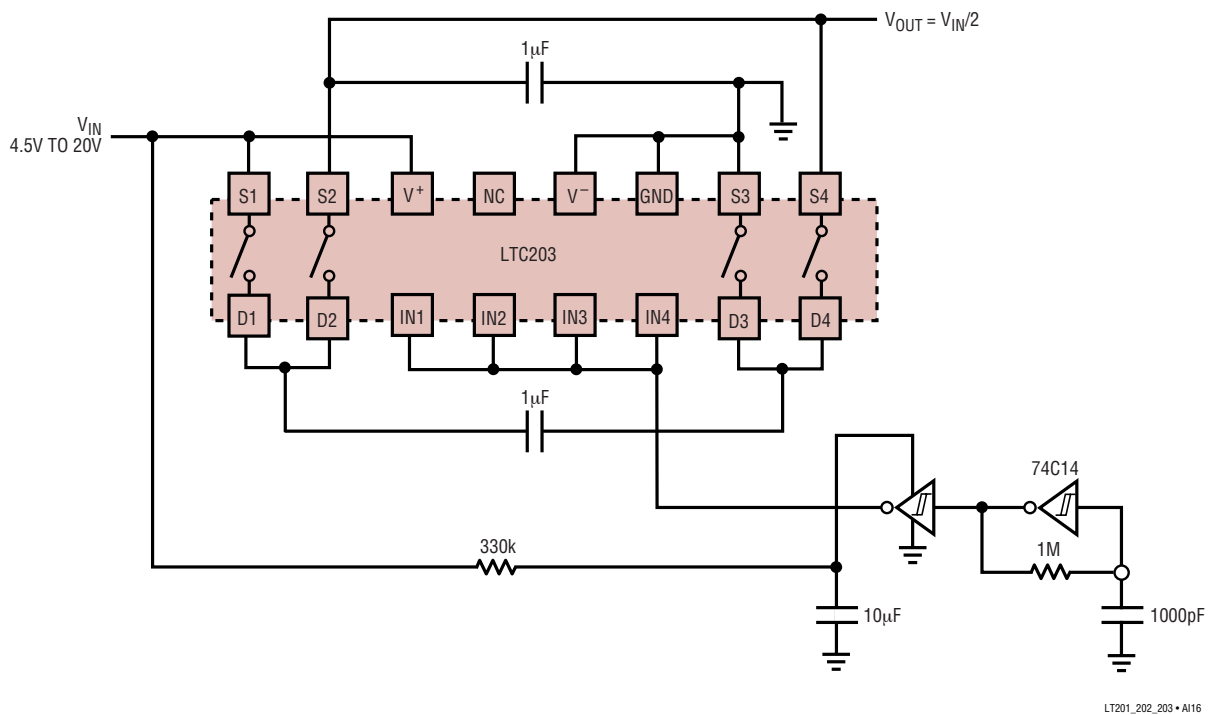
LT201_202_203 • A114

APPLICATIONS INFORMATION

Precision Current Sensing in Supply Rails

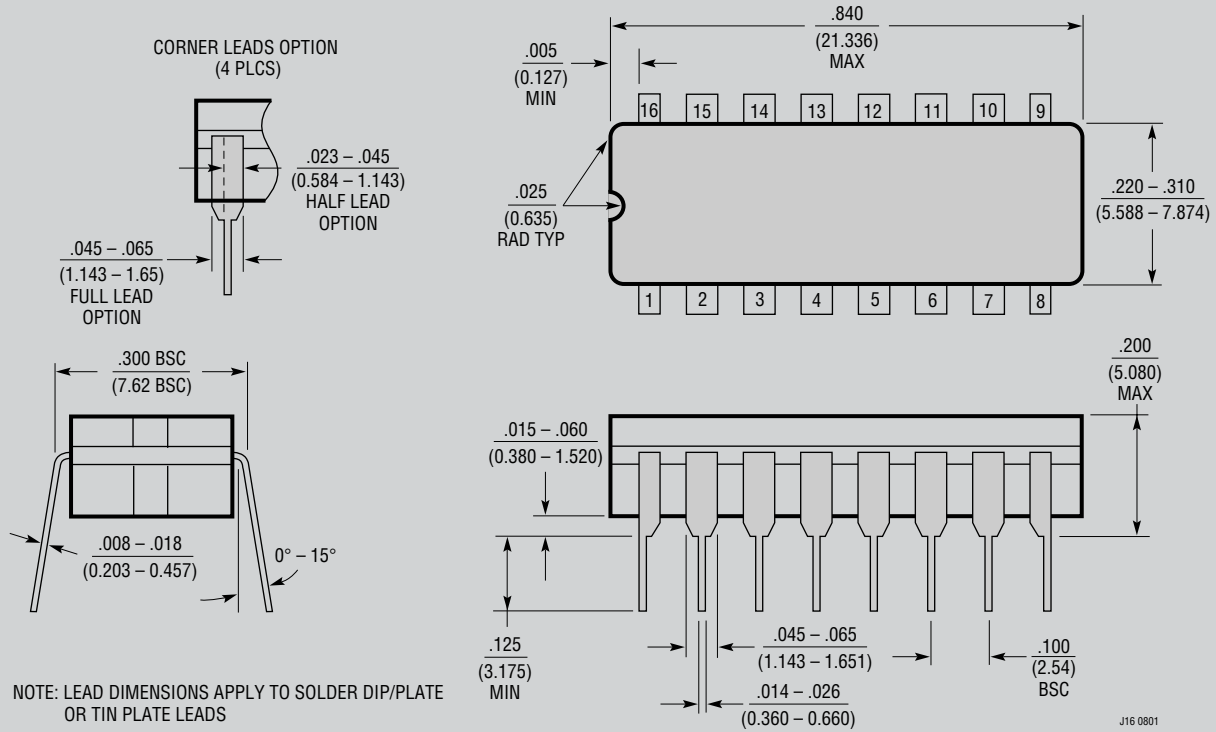


Precision Voltage Divide by 2 Circuit



PACKAGE DESCRIPTION

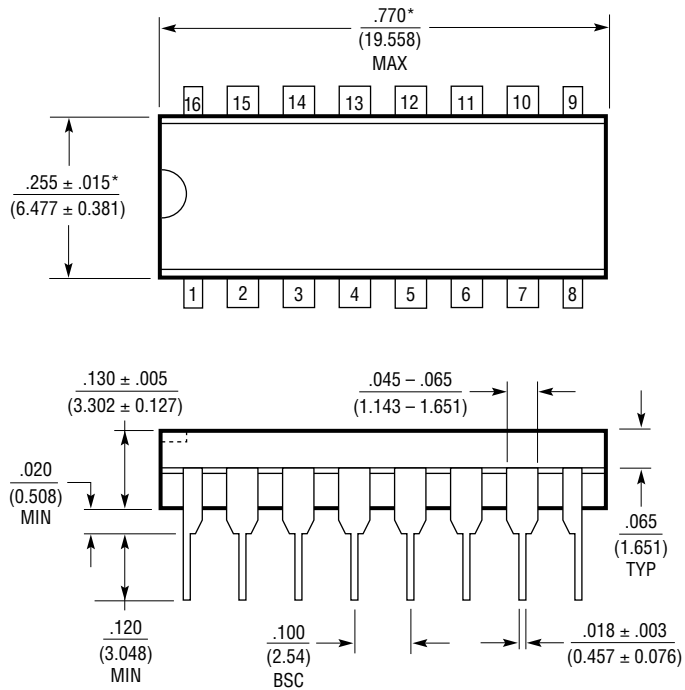
J Package
16-Lead CERDIP (Narrow .300 Inch, Hermetic)
 (Reference LTC DWG # 05-08-1110)



OBSOLETE PACKAGE

PACKAGE DESCRIPTION

N Package 16-Lead PDIP (Narrow .300 Inch) (Reference LTC DWG # 05-08-1510)



NOTE:
1. DIMENSIONS ARE $\frac{\text{INCHES}}{\text{MILLIMETERS}}$

*THESE DIMENSIONS DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS.
MOLD FLASH OR PROTRUSIONS SHALL NOT EXCEED .010 INCH (0.254mm)

N16 1002

LTC201A/LTC202/LTC203

RELATED PARTS

PART NUMBER	DESCRIPTION	COMMENTS
LTC221/LTC222	Micropower, Low Charge Injection, Quad CMOS Analog Switches	Parallel Controlled with Data Latches
LTC1380/LTC1393	8-Channel/4-Channel Differential Analog Multiplexer with SMBus Interface	3V to $\pm 15\text{V}$, $R_{\text{ON}} = 35\Omega$ Single-Ended/ 70Ω Differential
LTC1390/LTC1391	8-Channel, Analog Multiplexer with Serial Interface	3V to $\pm 15\text{V}$, $R_{\text{ON}} = 45\Omega$, Low Charge Injection
LT1675/LT1675-1	250MHz, Triple and Single RGB Multiplexer	100MHz Pixel Switching, $1100\text{V}/\mu\text{s}$ Slew Rate



Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



Как с нами связаться

Телефон: 8 (812) 309 58 32 (многоканальный)

Факс: 8 (812) 320-02-42

Электронная почта: org@eplast1.ru

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.