

LTC221/LTC222

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 1 ms, 10% Duty Cycle Max)	70mA

ESD Susceptibility (Note 3)

Power Dissipation (Plastic)

Power Dissipation (Ceramic)

Operating Temperature Range

LTC221C/LTC222C

LTC221M/LTC222M (OBSOLETE).....

Storage Temperature Range

Lead Temperature (Soldering, 10 sec)

PACKAGE/ORDER INFORMATION

N PACKAGE 16-LEAD PDIP $J_{MAX} = 110^\circ\text{C}$, $\theta_{JA} = 120^\circ\text{C/W}$ S PACKAGE 16-LEAD PLASTIC SO $J_{MAX} = 110^\circ\text{C}$, $\theta_{JA} = 130^\circ\text{C/W}$ J PACKAGE 16-LEAD CERDIP OBSOLETE PACKAGE Consider the N or S Package for Alternate Source	ORDER PART NUMBER
	LTC221CN LTC221CS LTC222CN LTC222CS
	LTC221MJ LTC221CJ LTC222MJ LTC222CJ

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

LOGIC TABLE

INX	$\overline{WR}$	LTC221	LTC222
0	0	On	Off
1	0	Off	On
X	1	Maintain Previous State	Maintain Previous State

DIGITAL AND DC ELECTRICAL CHARACTERISTICS

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

PARAMETER	CONDITIONS		LTC221M/LTC222M			LTC221C/LTC222C			UNITS
			MIN	TYP	MAX	MIN	TYP	MAX	
Analog Signal Range		●			± 15			± 15	V
R_{ON}	$V_S = \pm 10V$ $I_D = 1mA$	T_{MIN}			90			90	Ω
		25°C		65	90		65	90	Ω
		T_{MAX}			135			135	Ω
Off Input Leakage I_S (OFF)	$V_D = 14V$, $V_S = \pm 14V$			0.01	± 1		0.01	± 5	nA
		●			± 100			± 100	nA
Off Output Leakage I_D (OFF)	$V_{IN} = 2.4V$, LTC221 $V_{IN} = 0.8V$, LTC222			0.01	± 1		0.01	± 5	nA
		●			± 100			± 100	nA
On Channel Leakage I_D (ON)	$V_D = V_S = \pm 14V$, $V_{IN} = 2.4V$, LTC222 $V_{IN} = 0.8V$, LTC221			0.02	± 1		0.02	± 5	nA
		●			± 200			± 200	nA
Input High Voltage V_{INH} , V_{WRH}		●	2.4			2.4			V
Input Low Voltage V_{INL} , V_{WRL}		●			0.8			0.8	V
Input High or Low Current I_{INH} , I_{INL} , I_{WRH} , I_{WRL}	$V_{IN} = 15V$, 0V $V_{WR} = 15V$, 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 Channels On or Off $V_{IN} = V_{WR} = 0V$ or 4.0V			16	40		16	40	μA
		●			60			60	μA

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DIGITAL AND DC ELECTRICAL CHARACTERISTICS

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

PARAMETER	CONDITIONS		LTC221M/LTC222M			LTC221C/LTC222C			UNITS
			MIN	TYP	MAX	MIN	TYP	MAX	
I^-				0.1	5		0.1	5	μA
		●			10			10	

AC ELECTRICAL CHARACTERISTICS

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

PARAMETER	CONDITIONS		LTC221M/LTC222M			LTC221C/LTC222C			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	
t_{OPEN}			20	85		20	85		ns
Off Isolation	$V_S = 2\text{Vp-p}$, $R_L = 1\text{k}\Omega$ $f = 100\text{kHz}$			75			75		dB
Crosstalk				90			90		
Charge Injection O_{INJ}	$R_{\text{GEN}} = 0\Omega$, $C_L = 1000\text{pF}$, $V_{\text{GEN}} = 0$			5	± 25		8	± 25	pC
Total Harmonic Distortion THD	$V_S = 2\text{Vp-p}$, $R_L = 10\text{k}\Omega$			0.01			0.01		%
$t_{\text{ON}}, \overline{\text{WR}}$	$V_S = 2\text{V}$, $R_L = 1\text{k}\Omega$, $C_L = 35\text{pF}$			270	400		270	400	ns
$t_{\text{OFF}}, \overline{\text{WR}}$				160	300		160	300	

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 noted.

PARAMETER	CONDITIONS			LTC221M/LTC222M			LTC221C/LTC222C			UNITS
				MIN	TYP	MAX	MIN	TYP	MAX	
Analog Signal Range			●	0		5	0		5	V
R_{ON}	$V_S = 1.5\text{V}$, 3V $I_D = 0.25\text{mA}$	T_{MIN}				450			520	Ω
		25°C			280	450		280	520	Ω
		T_{MAX}				650			650	Ω
Off Input Leakage I_S (OFF)	$V_D = 4\text{V}$, 1V ; $V_S = 1\text{V}$, 4V (Note 4)				0.01	± 1		0.01	± 5	nA
		●				± 100			± 100	nA
Off Output Leakage I_D (OFF)					0.01	± 1		0.01	± 5	nA
		●				± 100			± 100	nA
On Channel Leakage I_D (ON)	$V_D = V_S = 1\text{V}$, 4V (Note 4)				0.01	± 1		0.01	± 5	nA
		●				± 200			± 200	nA
Input High Voltage V_{INH} , V_{WRH}			●	2.4			2.4			V
Input Low Voltage V_{INL} , V_{WRL}			●			0.8			0.8	V
Input High or Low Current I_{INH} , I_{INL} , I_{WRH} , I_{WRL}	$V_{\text{IN}} = 5\text{V}$, 0V $V_{\text{WR}} = 5\text{V}$, 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 Channels On or Off $V_{\text{IN}} = V_{\text{WR}} = 0\text{V}$ or 4.0V				8	20		8	20	μA
		●				30			30	μA

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AC ELECTRICAL CHARACTERISTICS $V^+ = 5V$, $V^- = GND = 0V$, unless otherwise noted.

PARAMETER	CONDITIONS	LTC221M/LTC222M			LTC221C/LTC222C			UNITS
		MIN	TYP	MAX	MIN	TYP	MAX	
t_{ON}	$V_S = 2V$, $R_L = 1k\Omega$, $C_L = 35pF$		450	600		450	600	ns
t_{OFF}			190	300		190	300	ns
t_{OPEN}		100	250		100	250		ns
Off Isolation	$V_S = 2V_{P-P}$, $R_L = 1k\Omega$		75			75		dB
Crosstalk	$f = 100kHz$		90			90		dB
Charge Injection O_{INJ}	$R_{GEN} = 0\Omega$, $C_L = 1000pF$, $V_{GEN} = 2.5V$		2			2		pC
Total Harmonic Distortion THD	$V_S = 2V_{P-P}$, $R_L = 10k\Omega$		0.01			0.01		%
$t_{ON}, \overline{WR}$	$V_S = 2V$, $R_L = 1k\Omega$, $C_L = 35pF$		430	600		430	600	ns
$t_{OFF}, \overline{WR}$			160	300		160	300	ns

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

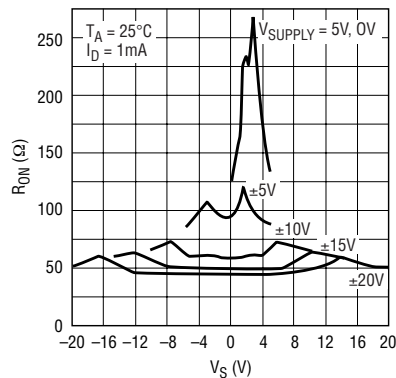
Note 2: Signals on S, D, or IN exceeding V^+ or V^- will be clamped by internal diodes. Limit forward diode current to maximum current rating.

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

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

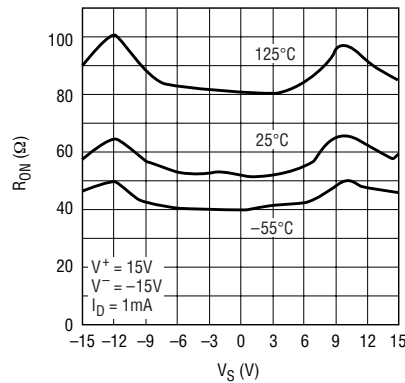
TYPICAL PERFORMANCE CHARACTERISTICS

R_{ON} vs V_S Over Supply Voltage



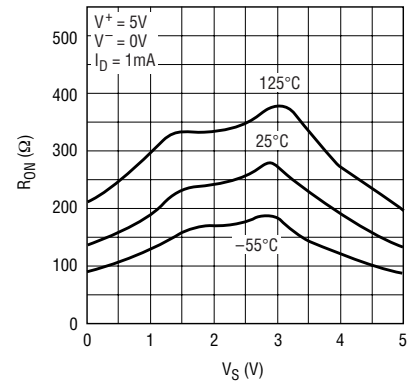
LTC221/222 • TPC01

R_{ON} vs V_S Over Temperature



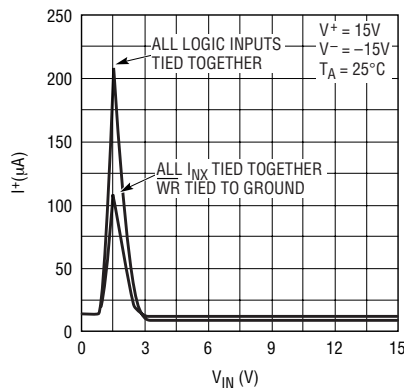
LTC221/222 • TPC02

R_{ON} vs V_S Over Temperature



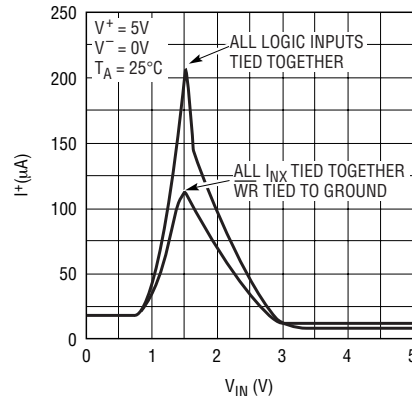
LTC221/222 • TPC03

Positive Supply Current vs Logic Input Voltage



LTC221/222 • TPC04

Positive Supply Current vs Logic Input Voltage



LTC221/222 • TPC05

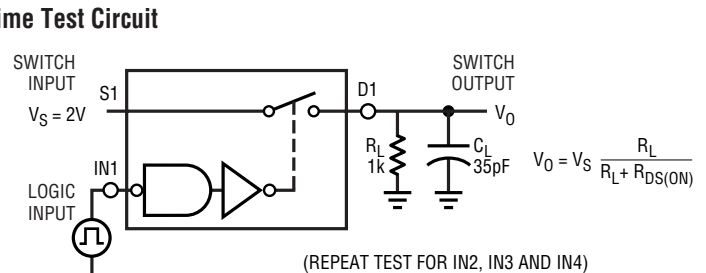
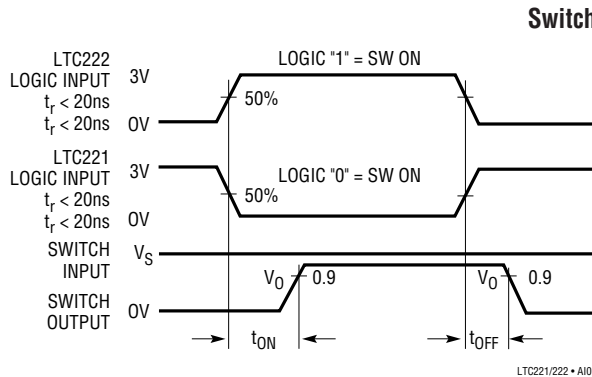
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APPLICATIONS INFORMATION

Switching Time Test Circuit

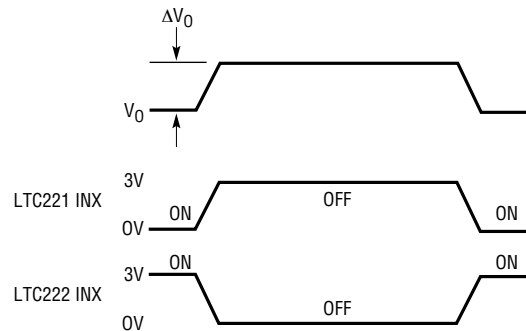
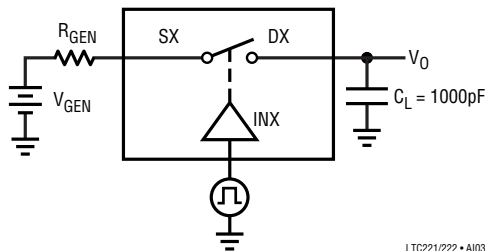
Switch output waveform shown for $V_S = \text{constant}$ with logic input waveform as shown. Note that V_S may be (+) or (–) as per switching time test circuit. V_O is the steady

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



LTC221/222 • A102

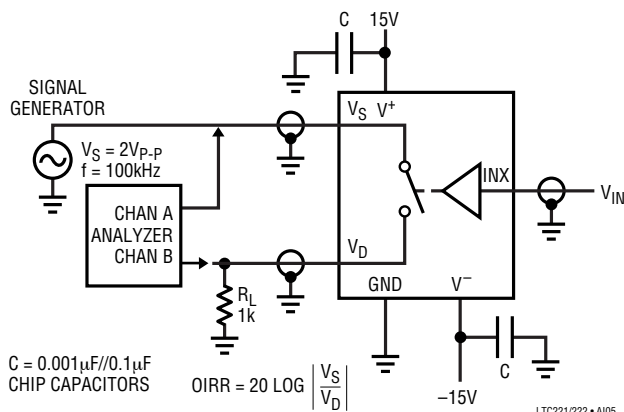
Charge Injection Test Circuit



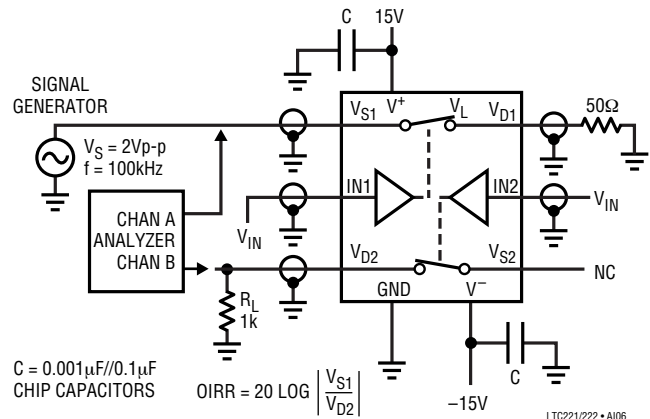
ΔV_O IS THE MEASURED VOLTAGE ERROR DUE TO CHARGE INJECTION.
 THE ERROR VOLTAGE IN COULOMBS IS $\Delta Q = V_L \cdot \Delta V_O$

LTC221/222 • A104

OIRR-Off Isolation Test Circuit



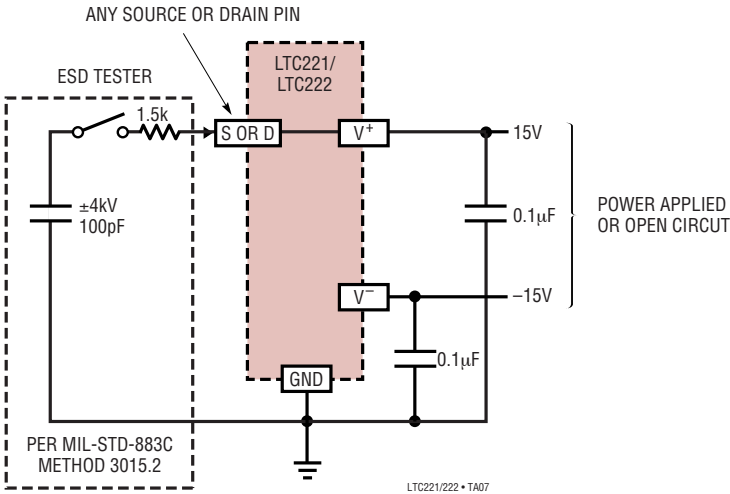
CCRR-Channel to Channel Crosstalk Test Circuit



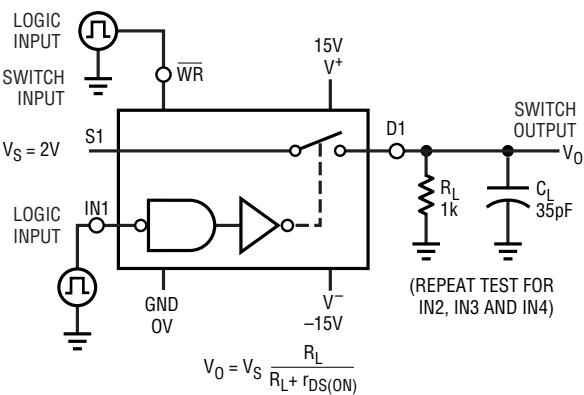
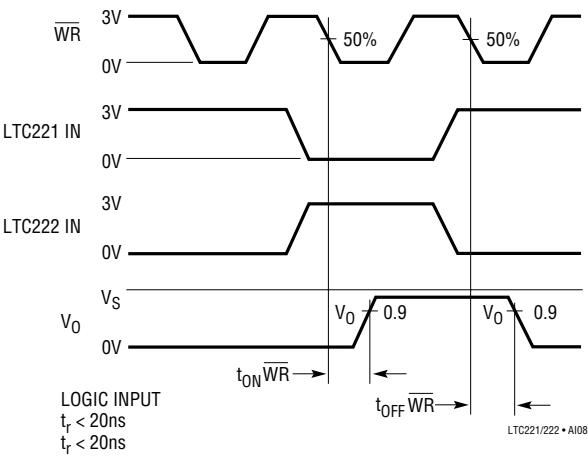
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APPLICATIONS INFORMATION

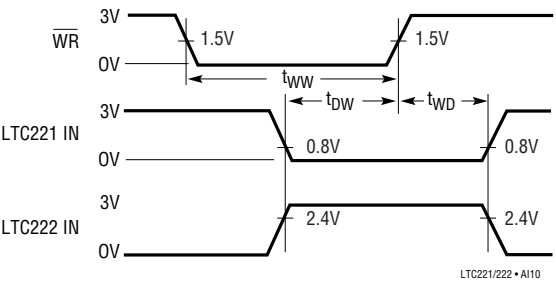
In-Circuit ESD Test Circuit



WR Switching Time Test Circuit



WR Setup Conditions

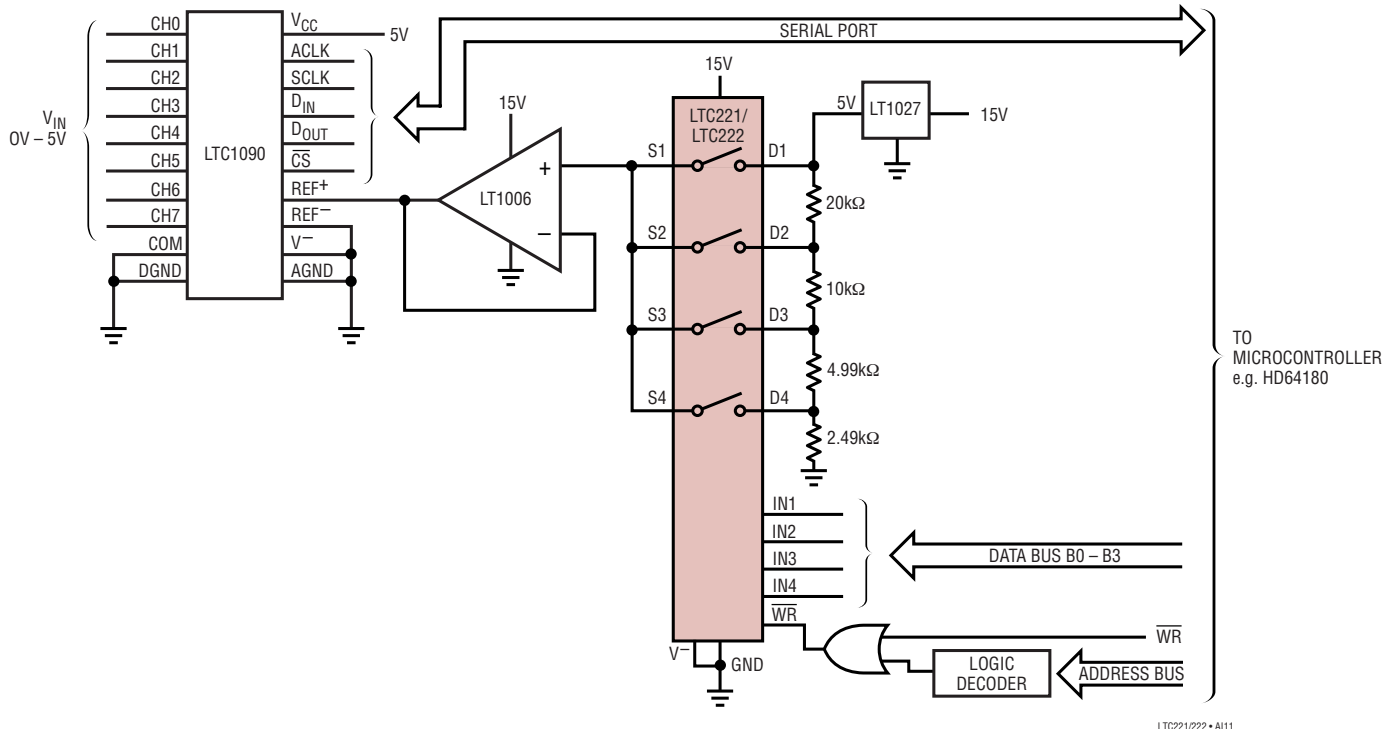


WR/Input Minimum Timing Requirements

PARAMETER	MIN LIMIT	UNITS
t _{WW}	230	ns
t _{DW}	180	ns
t _{WD}	30	ns

APPLICATIONS INFORMATION

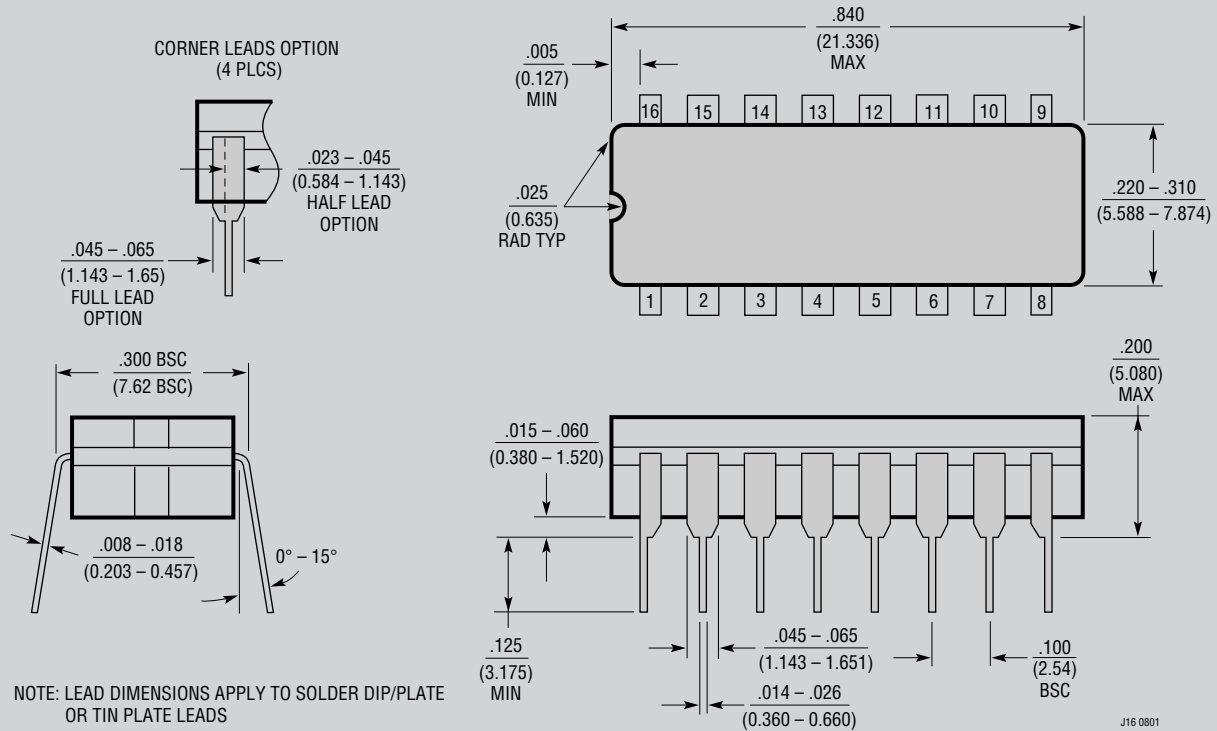
Auto Ranging an 8-Channel, 10-Bit A/D Converter



[illegible]

PACKAGE DESCRIPTION

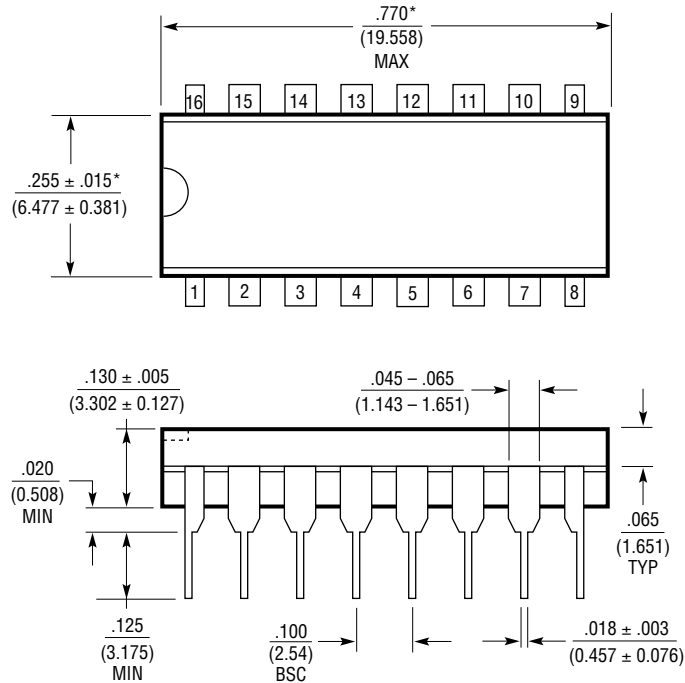
J Package
16-Lead CERDIP (Narrow .300 Inch, Hermetic)
 (Reference LTC DWG # 05-08-1110)



OBSOLETE PACKAGE

PACKAGE DESCRIPTION

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



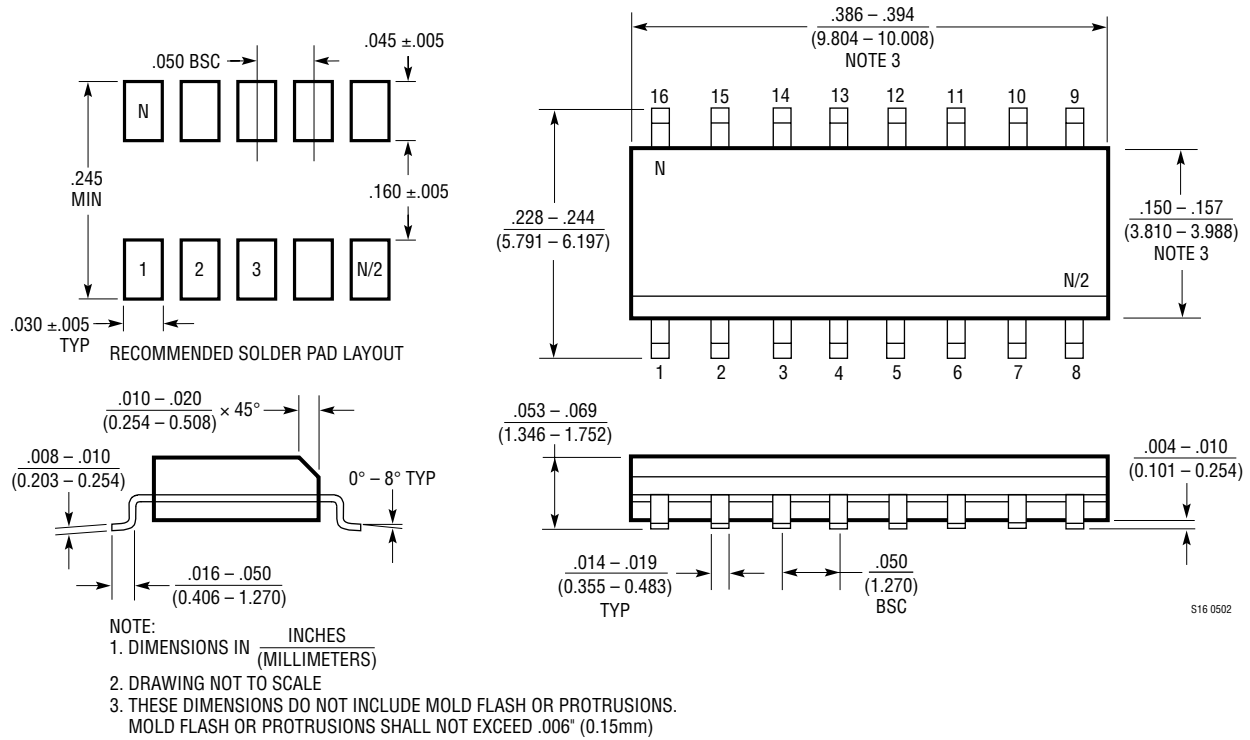
NOTE:

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 0502

PACKAGE DESCRIPTION

S Package 16-Lead Plastic Small Outline (Narrow .150 Inch) (Reference LTC DWG # 05-08-1610)



S16 0502

LTC221/LTC222

RELATED PARTS

PART NUMBER	DESCRIPTION	COMMENTS
LTC201/LTC202/LTC203	Micropower, Low Charge Injection, Quad CMOS Analog Switches	DG201/DG202 Compatible
LTC1380/LTC1393	8-Channel/4-Channel Analog Multiplexer with SMBus Interface	3V to $\pm 15V$, 8 Single Ended/4 Differential Inputs
LTC1390/LTC1391	8-Channel, Analog Multiplexer with Serial Interface	3V to $\pm 15V$ Operation