

April 2002

A/D Converters for 3-Digit Display

Features

- Dual Slope A/D Conversion
- Multiplexed BCD Display
- Ultra Stable Internal Band Gap Voltage Reference
- Capable of Reading 99mV Below Ground with Single Supply
- Differential Input
- Internal Timing - No External Clock Required
- Choice of Low Speed (4Hz) or High Speed (96Hz) Conversion Rate
- "Hold" Inhibits Conversion but Maintains Delay
- Overrange Indication
 - "EEE" for Reading Greater than +999mV, "-" for Reading More Negative than -99mV When Used With CA3161E

Description

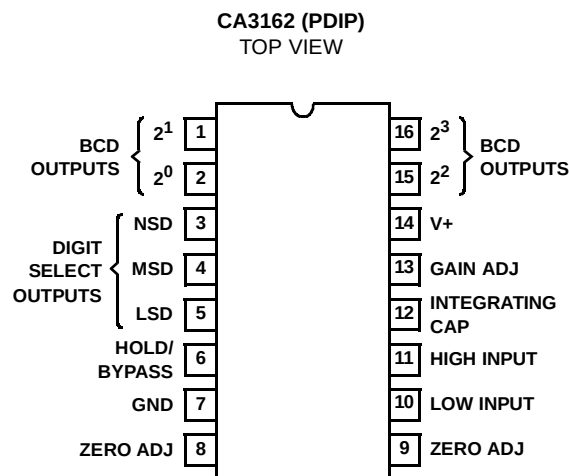
The CA3162E and CA3162AE are I^2L monolithic A/D converters that provide a 3 digit multiplexed BCD output. They are used with the CA3161E BCD-to-Seven-Segment Decoder/Driver and a minimum of external parts to implement a complete 3-digit display. The CA3162AE is identical to the CA3162E except for an extended operating temperature range.

The CA3161E is described in the Display Drivers section of this data book.

Ordering Information

PART NUMBER	TEMP. RANGE (°C)	PACKAGE	PKG. NO.
CA3162E	0 to 70	16 Ld PDIP	E16.3

Pinout



Absolute Maximum Ratings

DC Supply Voltage (Between Pins 7 and 14) +7V
 Input Voltage (Pin 10 or 11 to Ground) $\pm 15V$

Operating Conditions

Temperature Range
 CA3162E 0 to 75°C

CAUTION: Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

NOTE:

1. θ_{JA} is measured with the component mounted on a low effective thermal conductivity test board in free air. See Tech Brief TB379 for details..

Thermal Information

Thermal Resistance (Typical, Note 1) θ_{JA} (°C/W)
 PDIP Package 90
 Maximum Junction Temperature 150°C
 Maximum Storage Temperature Range -65°C to 150°C
 Maximum Lead Temperature (Soldering 10s) 300°C

Electrical Specifications $T_A = 25^\circ\text{C}$, $V_+ = 5V$, Zero Pot Centered, Gain Pot = 2.4k Ω , Unless Otherwise Specified

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Operating Supply Voltage Range, V_+		4.5	5	5.5	V
Supply Current, I_+	100k Ω to V_+ on Pins 3, 4, 5	-	-	17	mA
Input Impedance, Z_I		-	100	-	M Ω
Input Bias Current, I_{IB}	Pins 10 and 11	-	-80	-	nA
Unadjusted Zero Offset	$V_{11}-V_{10} = 0V$, Read Decoded Output	-12	-	+12	mV
Unadjusted Gain	$V_{11}-V_{10} = 900mV$, Read Decoded Output	846	-	954	mV
Linearity	Notes 1 and 2	-1	-	+1	Count
Conversion Rate					
Slow Mode	Pin 6 = Open or GND	-	4	-	Hz
Fast Mode	Pin 6 = 5V	-	96	-	Hz
Conversion Control Voltage (Hold Mode) at Pin 6		0.8	1.2	1.6	V
Common Mode Input Voltage Range, V_{ICR}	Notes 3, 4	-0.2	-	+0.2	V
BCD Sink Current at Pins 1, 2, 15, 16	$V_{BCD} \geq 0.5V$, at Logic Zero State	0.4	1.6	-	mA
Digit Select Sink Current at Pins 3, 4, 5	V_{DIGIT} Select = 4V at Logic Zero State	1.6	2.5	-	mA
Zero Temperature Coefficient	$V_I = 0V$, Zero Pot Centered	-	10	-	$\mu V/^\circ C$
Gain Temperature Coefficient	$V_I = 900mV$, Gain Pot = 2.4k Ω	-	0.005	-	%/ $^\circ C$

NOTES:

1. Apply 0V across V_{11} to V_{10} . Adjust zero potentiometer to give 000mV reading. Apply 900mV to input and adjust gain potentiometer to give 900mV reading.
2. Linearity is measured as a difference from a straight line drawn through zero and positive full scale. Limits do not include ± 0.5 count bit digitizing error.
3. For applications where low input pin 10 is not operated at pin 7 potential, a return path of not more than 100k Ω resistance must be provided for input bias currents.
4. The common mode input voltage above ground cannot exceed +0.2V if the full input signal range of 999mV is required at pin 11. That is, pin 11 may not operate higher than 1.2V positive with respect to ground or 0.2V negative with respect to ground. If the maximum input signal is less than 999mV, the common mode input voltage may be raised accordingly.

CA3162E Common-Cathode, LED Display Application

Figure 4 shows the CA3162E connected to a CD4511B decode/driver to operate a common-cathode LED display. Unlike the CA3161E, the CD4511B remains blank for all BCD codes greater than nine. After 999mV the display blanks rather than displaying EEE, as with the CA3161E. When displaying negative voltage, the first digit remains blank, instead of (-), and during a negative or positive over-range the display blanks.

The additional logic shown within the dotted area of Figure 4 restores the negative sign (-), allowing the display of negative numbers as low as -99mV. Negative overrange is indicated by a negative sign (-) in the MSD position. The rest of the display is blanked. During a positive overrange, only segment b of the MSD is displayed. One inverter from the CD4049B is used to operate the decimal points. By connecting the inverter input to either the MSD or NSD line either DP1 or DP2 will be displayed.

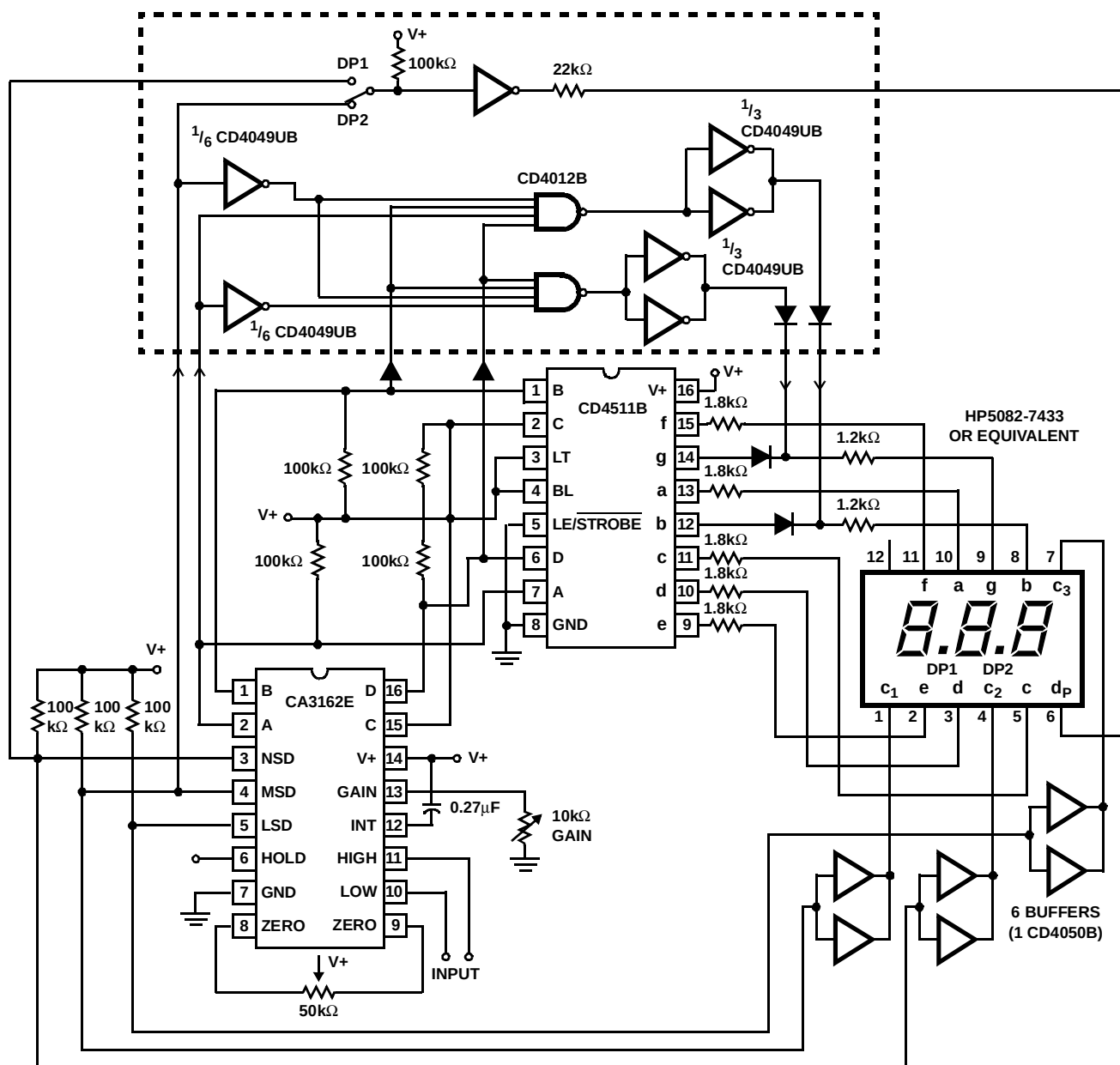


FIGURE 4. TYPICAL COMMON-CATHODE LED APPLICATION

CA3162

Die Characteristics

DIE DIMENSIONS:

101 mils x 124 mils x 20 mils ± 1 mil

METALLIZATION:

Type: Al

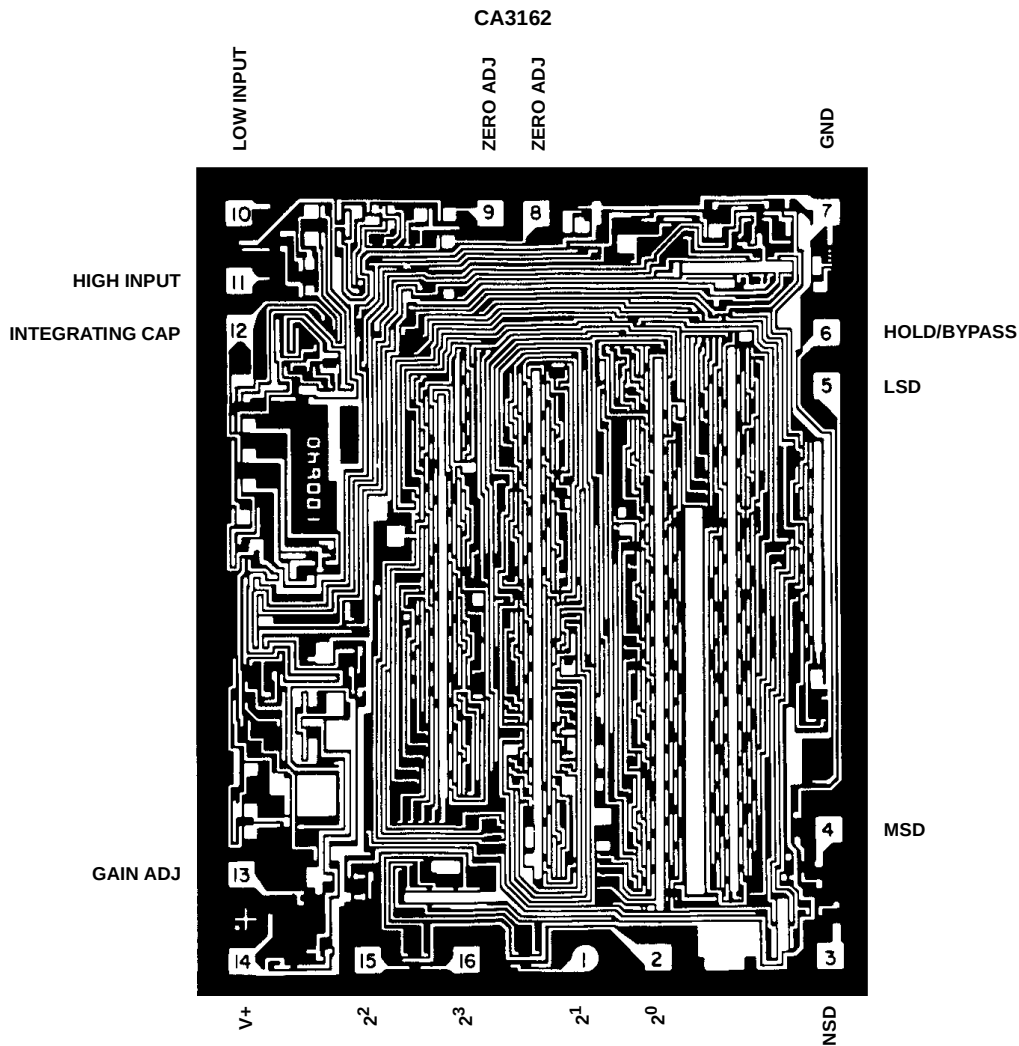
Thickness: $17.5\text{k}\text{\AA} \pm 2.5\text{k}\text{\AA}$

PASSIVATION:

Type: 3% PSG

Thickness: $13\text{k}\text{\AA} \pm 2.5\text{k}\text{\AA}$

Metallization Mask Layout



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