AD2700/AD2701/AD2702—SPECIFICATIONS (max or min @ E_{IN} ±15V @ +25°C, R_L = 2kΩ unless otherwise noted.)

MODEL	JD	LD	SD	UD
ABSOLUTE MAX RATINGS				
Input Voltage (for applicable supply)	±20V	*	*	*
Power Dissipation @ +25°C – AD2700, 01	300mW	*	*	*
– AD2702	450mW	*	*	*
Operating Temperature Range	–25°C to +85°C	*	–55°C to +125°C	***
Storage Temperature Range	–65°C to +150°C	*	*	*
Lead Temperature (soldering, 10s)	+300°C	*	*	*
Short Circuit Protection (to GND)	Continuous	*	*	*
OUTPUT VOLTAGE ERROR @ +25°C				
AD2700 10.000V	±0.005V	±0.0025V	*	**
AD2701 –10.000V	±0.005V	±0.0025V	*	**
AD2702 ±10.000V	±0.005V	±0.0025V	*	**
OUTPUT CURRENT[1] – @ +25°C	±10mA	*	*	*
(V_{IN} = ±13 to ±18V) over op. temp. range	±5mA	+5mA, –2mA	**	**
OUTPUT VOLTAGE ERROR – AD2700,01	10ppm/°C	3ppm/°C	**	**
(T_{min} to T_{max})[2]	±11.0mV	±4.3mV	±8mV	±5.5mV
AD2702	10ppm/°C	5ppm/°C	**	3ppm/°C
	±11.0mV	±5.5mV	±10.0mV	±5.5mV
LINE REGULATION				
V_{IN} = ±13.5 to ±16.5V	300μV/V	*	*	*
LOAD REGULATION				
0 to ±10mA	50μV/mA	*	*	*
OUTPUT RESISTANCE	0.05Ω	*	*	*
INPUT VOLTAGE, OPERATING	±13V to ±18V	*	*	*
QUIESCENT CURRENT – AD2700, 01	±14mA	*	*	*
– AD2702	+17mA, –4mA	*	*	*
NOISE				
(0.1 to 10Hz)	50μV p-p typ	*	*	*
LONG TERM STABILITY (@ +55°C)	100ppm/1000 Hrs. (typ)	*	*	*
OFFSET ADJUST RANGE				
(See Diagrams)	±20mV (min)	*	*	*
OFFSET ADJUST TEMP DRIFT EFFECT	±4μV/°C per mV of Adjust (typ)	*	*	*
PACKAGE OPTION[3,4]	DH-14C	DH-14C	DH-14C	DH-14C

NOTES
*Same as "JD" grade performance.
**Same as "LD" grade performance.
***Same as "SD" grade performance.

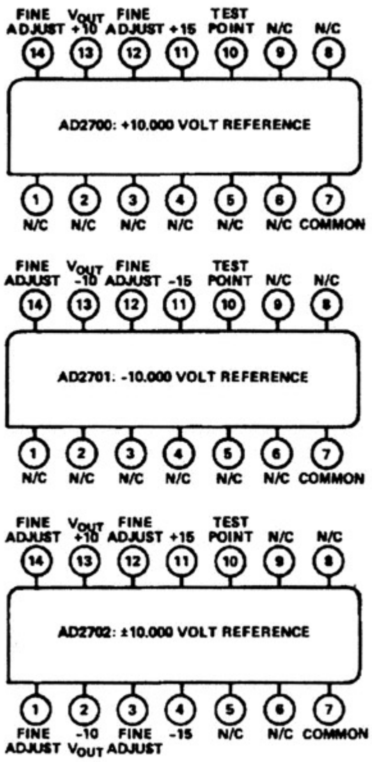
[1] Specified with resistive load to common. Device not intended for use in driving a dynamic load.

[2] Output voltage error as a function of temperature is determined using the box method. Each unit is tested at T_{min}, T_{max} and +25°C. At each temperature V_{OUT} must fall within the rectangular area bounded by the minimum and maximum temperature and whose maximum V_{OUT} value is equal to V_{OUT} nominal plus or minus the maximum +25°C error plus the maximum drift error from +25°C. The box limits are noted below the drift values used to calculate the box.

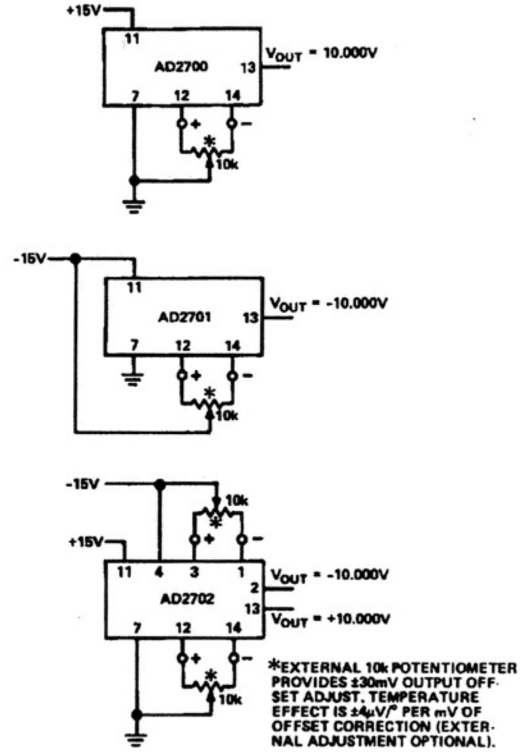
[3] Analog Devices reserves the right to ship side-brazed ceramic packages (outline DH-14D) in lieu of the standard ceramic packages for J and L grade parts."

[4] See Section 14 for package outline information.

Specifications subject to change without notice.



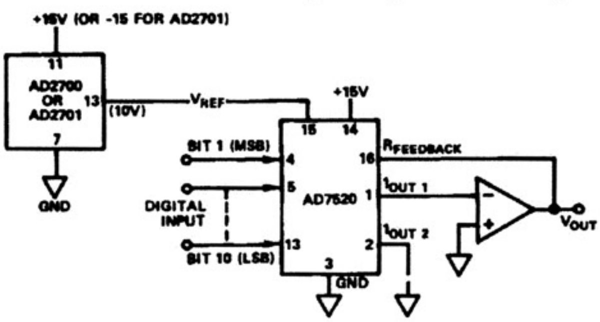
Pin Designations



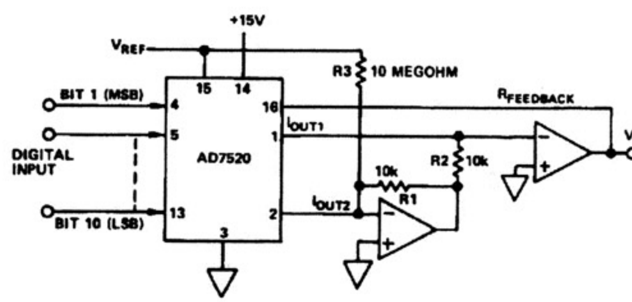
Fine Trim Connections

USING AD2700 REFERENCE WITH THE AD7520 AND AN IC AMPLIFIER TO BUILD A DAC

The AD2700 series is ideal for use with the AD7520 series of CMOS D/A converters. A CMOS converter in a unipolar application as shown below performs an inversion of the voltage reference input. Thus, use of the +10 volt AD2700 reference will result in a 0 to -10 volt output range. Alternatively, using the -10 volt AD2701 will result in a 0 to +10 volt range. Two operational amplifiers are used to give a bipolar output range of -10 volt to +10 volt, as shown in the lower figure. Either the AD2700 or AD2701 can be used, depending on the transfer code characteristic desired. For more detailed applications information, refer to the AD7520 Data Sheet.



Unipolar Binary Operation



Bipolar Operation (4-Quadrant Multiplication)

DIGITAL INPUT	ANALOG OUTPUT
1111111111	$-V_{REF}\ (1 - 2^{-10})$
1000000001	$-V_{REF}\ (1/2 + 2^{-10})$
1000000000	$\frac{-V_{REF}}{2}$
0111111111	$-V_{REF}\ (1/2 - 2^{-10})$
0000000001	$-V_{REF}\ (2^{-10})$
0000000000	0

NOTE: 1 LSB = $2^{-10}\ V_{REF}$

Table I. Code Table – Unipolar Binary Operation

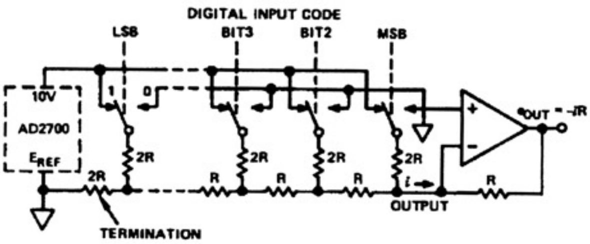
DIGITAL INPUT	ANALOG OUTPUT
1111111111	$-V_{REF}\ (1 - 2^{-9})$
1000000001	$-V_{REF}\ (2^{-9})$
1000000000	0
0111111111	$V_{REF}\ (2^{-9})$
0000000001	$V_{REF}\ (1 - 2^{-9})$
0000000000	V_{REF}

NOTE: 1 LSB = $2^{-9}\ V_{REF}$

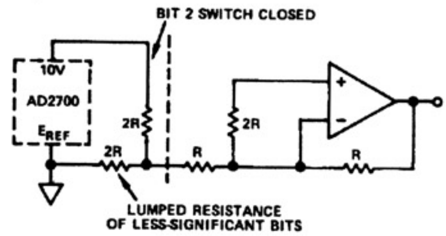
Table II. Code Table – Bipolar (Offset Binary) Operation

USING THE AD2700 VOLTAGE REFERENCE WITH D/A CONVERTER

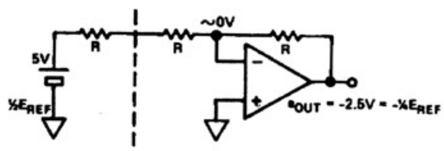
An AD2700 Voltage Reference can be used with an inverting operational amplifier and an R-2R ladder network. If all bits but the MSB are off (i.e., grounded), the output voltage is $(-R/2R)E_{REF}$. If all bits but Bit 2 are off, it can be shown that the output voltage is $½(-R/2R)E_{REF} = ¼E_{REF}$: The lumped resistance of all the less-significant-bit circuitry (to the left of Bit 2) is 2R; the Thevenin equivalent looking back from the MSB towards Bit 2 is the generator, $E_{REF}/2$, and the series resistance 2R; since the grounded MSB series resistance, 2R, has virtually no influence – because the amplifier summing point is at virtual ground – the output voltage is therefore $-E_{REF}/4$. The same line of thinking can be employed to show that the nth bit produces an increment of output equal to 2^{-n} E_{REF}.



a. Basic Circuit



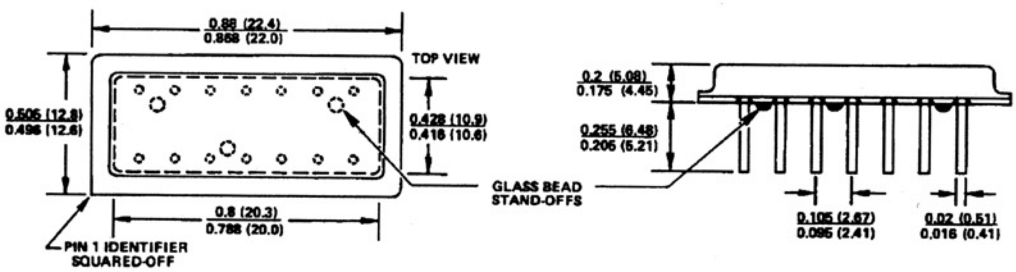
b. Example: Contribution of Bit 2; All Other Bits "0"



c. Simplified Equivalent of Circuit (b.)

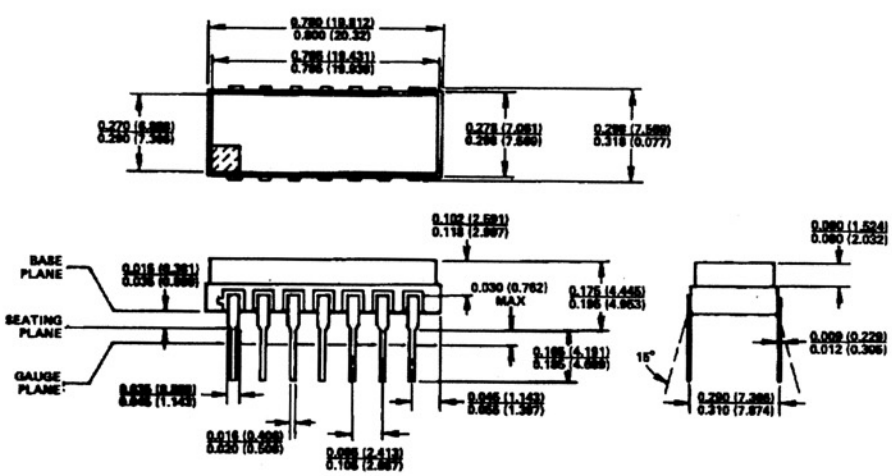
PACKAGE DIMENSIONS

Dimensions shown in inches and (mm).



Hermetically sealed 14-Pin Dual-In-Line (Gross leak tested per MIL-STD-883, Method 1014)
Pin 7 is electrically connected to the case. Case has metal bottom surface.

14-Pin Dual-In-Line Metal Package



14-Pin Dual-In-Line Ceramic Package

C350a–8–8/83

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