Low Cost 4¾ Digit DPMs With LED Displays

AD2025/AD2028

OBSOLETE

FEATURES

- "Second Generation" MOS-LSI Design
- Large 0.43" (11mm) LED Displays
- 4¾ Digit Resolution — 40,000 Counts Full Scale
- Limited Differential Input
- Either Line Powered (AD2025) or Logic Powered (AD2028)
- Interchangeable with 4½ Digit DPMs (AD2024 or AD2027)
- Industry Standard Case Designs

APPLICATIONS

High Resolution/High Accuracy Readout for:

- Test Equipment
- Process Control Instrumentation
- Analytical and Scientific Instruments



GENERAL DESCRIPTION

The AD2025 and AD2028 are low cost 4¾ digit DPMs with large LED displays. Both units offer the same features and identical performance, but the AD2025 is ac line powered and the AD2028 is +5V dc powered.

The AD2025 and AD2028 are interchangeable with two 4½ digit DPMs available from Analog Devices, the AD2024 and AD2027 respectively. Thus, they can be used in applications where either a 4¾ or 4½ digit display may be desirable in one basic application.

THE BENEFITS OF SECOND GENERATION DESIGN

The AD2025 and AD2028 are designed around MOS-LSI (Metal Oxide Semiconductor, Large Scale Integration) integrated circuits which greatly reduce the number of components and interconnections required to provide the performance and features expected in a high resolution 4¾ digit DPM.

This "Second Generation" design, therefore, offers greatly increased reliability and significantly lower cost at little compromise in performance. The large 0.43 inch (11mm) LED displays offer the brightness and readability previously available only with gas discharge displays with the added advantage of an all solid state component.

HIGH RESOLUTION AND VERSATILE FEATURES

These DPMs measure DC input voltages over a full scale range of ±3.9999V or ±39.999V with an accuracy of ±0.005% reading ±0.005% of full scale ±1 digit. Using the "limited differential" input first used by Analog Devices on the AD2010, the AD2025 and AD2028 prevent ground loop problems and provide 50dB of common mode rejection at common mode voltages up to ±200mV. Normal mode rejection is 25dB at 50–60Hz.

BCD data outputs are provided in a bit parallel, character serial format compatible with CMOS logic systems. When applications require parallel BCD data, such as interfaces to printers, comparators or slave displays, parallel BCD output options are available that are compatible to standard TTL logic systems.

External power supply outputs at +5V and -25V (-25V only on the AD2028) are made available for powering external circuitry. In addition, control inputs for conversion "Hold", display blanking and decimal point selection are provided.

INDUSTRY STANDARD CASE DESIGNS

Although both the AD2025 and AD2028 have identical electrical designs, they are packaged in the case sizes that have become industry standards for ac line powered and +5V dc logic powered DPMs respectively. The AD2025 fits the 3.924" x 1.682" (99.67 x 42.74mm) panel cutout common to most ac line powered DPMs, and the AD2028 fits the 3.175" x 1.810" (80.65 x 45.97mm) panel cutout of the Analog Devices logic power case design, now used by several other manufacturers of logic powered DPMs. Thus, interchangeability is assured, allowing mechanical second sourcing for both these DPMs.

DESIGNED AND BUILT FOR RELIABILITY

Even beyond the reliability advantages of the LSI-IC design and LED displays, the AD2025 and AD2028 have had extreme care taken in their design and manufacture to insure reliability. Manufacturing processes are monitored by continual quality assurance inspections to insure proper workmanship and testing. Automatic test equipment is used to test each DPM thoroughly and without error. And each AD2025 and AD2028, like every Analog Devices DPM, receives a full one week failure-free burn-in with power cycling before shipment.

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SPECIFICATIONS (typical at +25°C and nominal power supply voltage)

DISPLAY OUTPUTS
- Seven Segment LED Display, 0.43″ (11mm) high, for four data digits and 300% overrange.
- Overload indication by blanking all digits except overrange, which indicates "0".
- Decimal points (5) selectable at input.
- Display Blanking

ANALOG INPUT
- Configuration: Bipolar, limited differential
- Full Scale Range: ±3.9999V (±39.999V, "V" option)
- Automatic Polarity (See applications section for details on polarity display)
- Input Impedance: 100MΩ (1MΩ, "V" option)
- Bias Current: 30nA (3nA, "V" option)
- Overvoltage Protection: 120V rms sustained

ACCURACY
- ±0.005% reading ±0.005% full scale ±1 digit[1]
- Resolution: 100μV (1mV, "V" option)
- Temperature Range[2]: 0 to +50°C operating. -20 to +85°C storage. (AD2025/B: 0 to +45°C operating)
- Temperature Coefficient: Gain: ±30ppm/°C. Zero Offset: ±10μV/°C (±40ppm/°C and ±100μV/°C, "V" option)
- Warmup Time: One minute to rated accuracy
- Settling Time to Rated Accuracy: 450ms

NORMAL MODE REJECTION
- 25dB at 50–60Hz

COMMON MODE REJECTION
- 50dB, DC to 1kHz, ±200mV common mode voltage
- AD2025 (floated on power supply transformer if data outputs and control signals are not used) – 110dB at 120V rms common mode voltage, 1kΩ imbalance at input.

CONVERSION TIME
- 300ms for full scale reading
- 400ms for overload conversion

CONVERSION RATE
- 3 conversions per second

DIGITAL INTERFACE SIGNALS
- Inputs

  Display Blank – (open collector TTL Compatible, 4 TTL Loads). Logic "0" or grounding blanks display, but not decimal points. The display is valid immediately upon removal of the blanking signal.

  Hold – (DTL/TTL Compatible, 2 TTL Loads). Logic "0" or grounding causes the DPM to hold and display the last conversion. Upon removal of the hold, the DPM resumes conversions.

  Decimal Points – (Not TTL Compatible). Logic "0" or grounding turns on appropriate decimal point. External circuitry must sink 35mA when a decimal point is illuminated.
- Outputs

  DTL/TTL Compatible[3] – Status. Logic "1" indicates conversion in process. All digital outputs are valid when status is at logic "0". 4 TTL loads. – Polarity. Logic "1" indicates positive polarity, unlatched. 6 TTL loads. – Overload, Logic "1" indicates overload (≥40,000), unlatched 4 TTL Loads.

  CMOS and LP Schottky Compatible – BCD outputs, 4¾ BCD digits, character serial, bit parallel, 1 LP Schottky load.

  Parallel BCD Output (Option"B"). – 4¾ BCD digits, positive true, latched. Drives 5 TTL loads. – Data Ready. Logic "1" indicates output data is valid. Drives 2 TTL loads. – Polarity. Logic "1" indicates positive polarity, latched, Drives 2 TTL loads.

EXTERNAL POWER SUPPLY OUTPUTS
- AD2025: +5V at 25mA, -25V at 5mA
- AD2028: -25V at 5mA

POWER SUPPLY INPUTS
- AD2025: ac line, 50–60Hz, 4W
- AD2028: 5V dc, ±5% at 800mA

CALIBRATION ADJUSTMENTS
- Gain
- Zero
- Recommended recalibration interval: 6 months

SIZE
- AD2025: 3.92″W x 1.67″H x 4.48″D (100 x 42 x 114mm)
  Panel cutout: 3.930″ x 1.682″ (99.8 x 42.7mm)
- AD2028: 3″W x 1.8″H x 4″D (76 x 46 x 102mm)
  Panel cutout: 3.175″ x 1.810″ (80.65 x 45.97mm)

WEIGHT
- AD2025: 14 ounces (395 grams)
- AD2028: 10 ounces (280 grams)

OPTIONS – ORDERING GUIDE[4]
- AD2025

  AC Power Inputs – No cost option

  AD2025 – 117V ac
  AD2025/E – 220V ac
  AD2025/F – 100V ac
  AD2025/H – 240V ac
  } ±10%

  Input Range Options – No cost option
  AD2025 – ±3.9999V Full Scale
  AD2025/V – ±39.999V Full Scale
  Data Output Options
  AD2025 – Character serial data outputs
  AD2025/B – Parallel BCD option
  Display Lens Options[5]
  Lens 7 – Red with ADI logo
  Lens 8 – Red without ADI logo
  Connector – 36 pin, 0.156″ spacing, card edge connector, Viking 2VK18D/1-2 or equivalent. – Optional: Order AC2610.

  AD2025/B option also requires a 30 pin, 0.156″ spacing, card edge connector, Viking 2VK15D/1-2 or equivalent. – Optional: Order AC1501.
- AD2028

  Input Range Options – No cost option
  AD2028 – ±3.9999V Full Scale
  AD2028/V – ±39.999V Full Scale
  Data Output Options
  AD2028 – Character serial data outputs
  AD2028/B – Parallel BCD option
  Display Lens Options[5]
  Lens 5 – Red with ADI logo
  Lens 6 – Red without ADI logo
  Connector – AC1501 (see above) or equivalent. AD2028/B option requires two each.

NOTES
[1] Guaranteed at +25°C and nominal power supply voltage.
[2] Guaranteed.
[3] For CMOS compatibility, 3.3k pullup resistors to the +5V output of the DPM are required.
[4] Only one AC Power Input and/or Input Range option may be specified. The "B" option can be ordered with any combination of power and range options.
[5] If no lens is specified, Lens 5 or 7 is supplied as appropriate.

Specifications subject to change without notice.

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APPLYING THE AD2025 AND AD2028

Wiring Connections

Figures 1 and 2 are wiring diagrams for AD2025 and AD2028 applications. The "limited differential" input uses a 100Ω resistor to isolate the analog input from the digital and power supply sections to prevent ground loop problems. The analog input must be connected between the "analog high" and "analog ground" inputs only, since in some applications there may be up to a ±200mV CMV difference between analog and digital grounds.

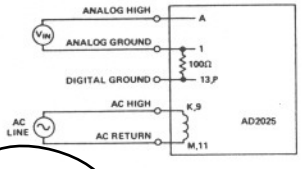


Figure 1. AD2025 Wiring Interconnections

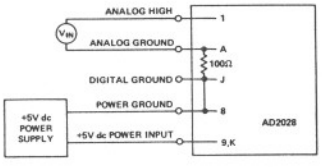


Figure 2. AD2028 Wiring Interconnections

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Polarity Indication

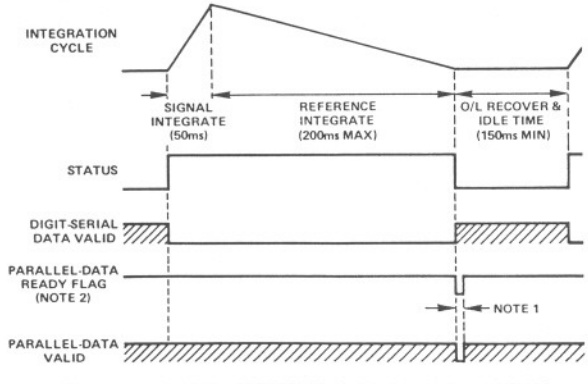
No direct polarity indication is provided on the AD2025 or AD2028 although both DPMs measure bipolar inputs. If indication of negative polarity is desired, the "polarity" output can be connected to the far left-hand decimal point (DP .XXXXX) provided. When the polarity is negative, this decimal point will then be illuminated.

Interfacing Data Outputs

The standard data outputs are in a bit parallel character serial format compatible to CMOS and LP Schottky logic systems. The BCD outputs are multiplexed, and a digit output is provided for each of the five digits of output. Thus, the four BCD lines on the output at a given time are valid for the digit whose digit line is currently high. The bit parallel character serial data is valid when the DPM status line is low for a period of 150ms between each conversion cycle. The overload line is latched output which is at logic "1", whenever the input exceeds the full 40,000 count range.

Optional parallel BCD outputs ("B" option) are available on a separate card which is internally connected to the DPM. The output data then is presented in a full parallel format and is latched. The parallel data is valid whenever the data ready output is high.

Pin connections for the "B" option are shown in the interconnection tables and a full timing diagram is shown in Figure 3.



NOTE 1. APPROXIMATE 5ms REQUIRED TO LOAD PARALLEL-OUT REGISTERS.
NOTE 2. B OPTION.

Figure 3. AD2025/AD2028 Timing Diagram

PIN	FUNCTION	PIN	FUNCTION
1	Analog Ground	A	Analog High
2	10^1 Digit	B	10^0 Digit (LSD)
= KEY		= KEY	
3	BCD 2	C	10^2 Digit
4	10^3 Digit	D	BCD 4
5	BCD 8	E	BCD 1
6	Mux Step[1]	F	10^4 Digit (MSD)
7	+5V dc (Out)	H	-25V dc (Out)
8	NC	J	NC
9	AC High	K	AC High
10	NC	L	NC
11	AC Return	M	AC Return
12	NC	N	NC
13	Digital Ground	P	Digital Ground
14	DP .XXXXX	R	Status
15	Polarity	S	Hold
16	Display Blank	T	DPX.XXXX
17	DPXXXX.X	U	DPXX.XXX
18	Overload	V	DPXXX.XX

NOTE 1: BCD multiplexer clock pulse available for remote placement of BCD option.

AD2025 — Signal and Pin Connections

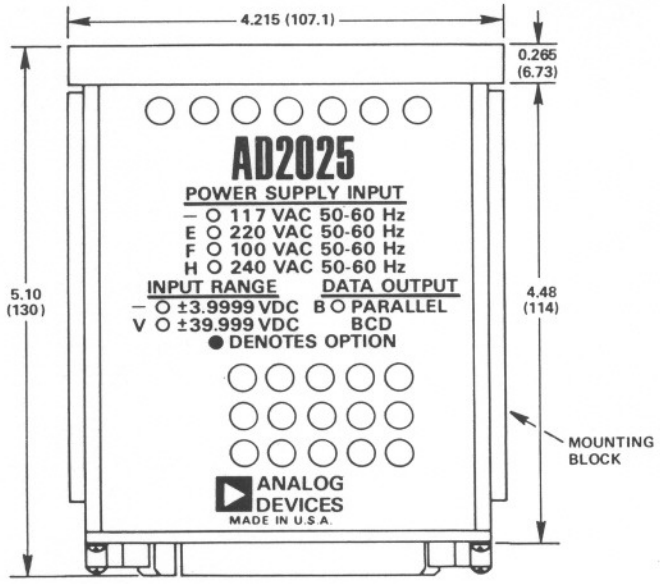
PIN	FUNCTION	PIN	FUNCTION
1	Analog High	A	Analog Ground
2	10^0 Digit (LSD)	B	Mux Step[1]
3	BCD 8	C	BCD 1
4	BCD 2	D	BCD 4
5	10^4 Digit (MSD)	E	10^1 Digit
6	10^3 Digit	F	10^2 Digit
7	NC	H	-25V dc (Out)
8	Power Ground	J	Digital Ground
9	+5V (In)	K	+5V (In)
10	NC	L	NC
= KEY		= KEY	
11	Display Blank	M	DP.XXXXX
12	Hold	N	Polarity
13	Overload	P	Status
14	DPX.XXXX	R	DPXX.XXX
15	DPXXX.XX	S	DPXXXX.X

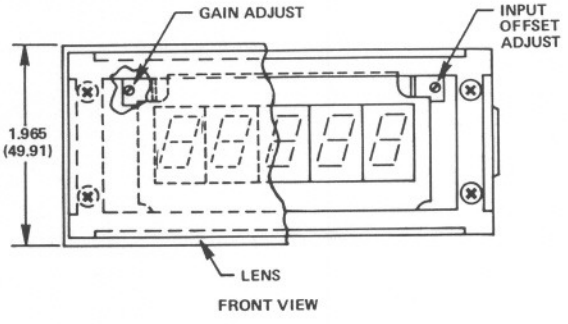
AD2028 — Signal and Pin Connections

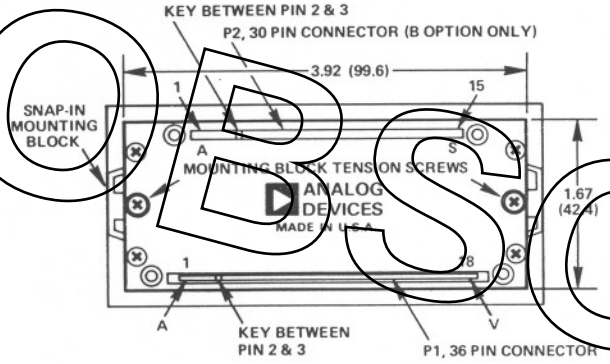
PIN	FUNCTION	PIN	FUNCTION
1	+5V dc (in)	A	BCD 20,000
2	BCD 1 (In)	B	BCD 8 (In)
= KEY		= KEY	
3	BCD 4 (In)	C	BCD 2 (In)
4	BCD 2000	D	BCD 4
5	BCD 40	E	BCD 80
6	BCD 800	F	BCD 8000
7	BCD 100	H	BCD 1000
8	BCD 10,000	J	BCD 200
9	BCD 20	K	BCD 2
10	BCD 8	L	BCD 10
11	BCD 1	M	BCD 4000
12	BCD 400	N	10^4 Digit (In)
13	Data Ready	P	Status (In)
14	Polarity (In)	R	Mux Step (In)
15	Polarity (Out)	S	Digital Ground

NOTES: 1) Overload output is on main DPM connector.
2) Pins marked "In" are made available for remote placement of BCD option card and are not normally used since all connections are internal.

AD2025/AD2028 BCD Options — Signal and Pin Connections



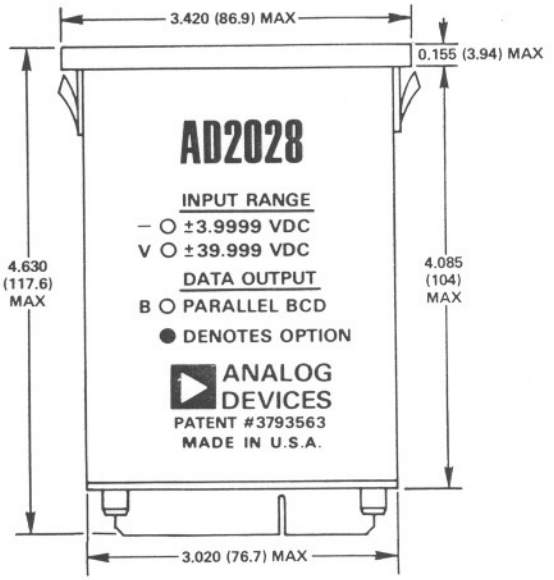


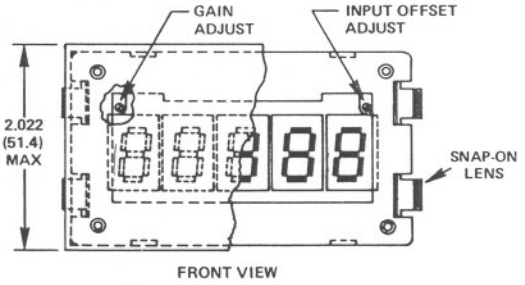


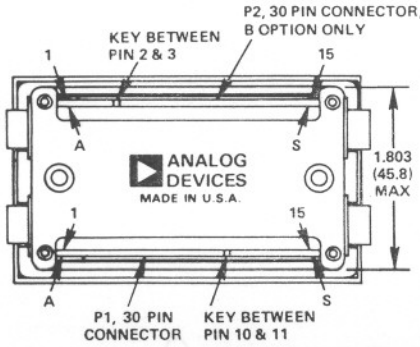
PANEL CUTOUT: 3.930 X 1.682 (99.82 X 42.72)

Figure 4. AD2025 Mechanical Outline (Dimensions shown in inches and (mm))

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PANEL CUTOUT: 3.175 X 1.810 (80.65 X 45.97)

Figure 5. AD2028 Mechanical Outline (Dimensions shown in inches and (mm))

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