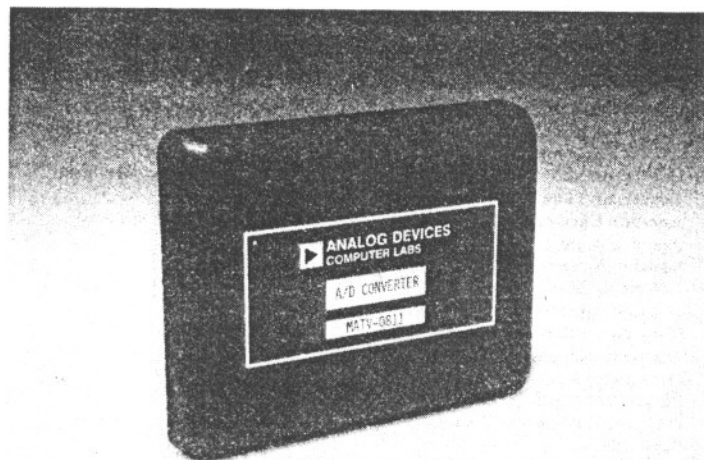


FEATURES

- 8-Bit Accuracy — Guaranteed Monotonic
- Ultra-High Speed — dc to 20MHz Word Rates
- Most Economical Video A/D
- Smallest Available Complete A/D — 5.5" × 4.38" × 0.85"
- Self Contained — Includes Input Buffer, Encoder, Reference, Timing, and Buffered Parallel Output

APPLICATIONS

- Digitize Color Television at Up to Three or Four Times NTSC or PAL Color Subcarrier Frequencies
- Video Time Base Correction and Frame Synchronization
- Radar Signal Processing
- Real Time Transient and Continuous Spectrum Analysis

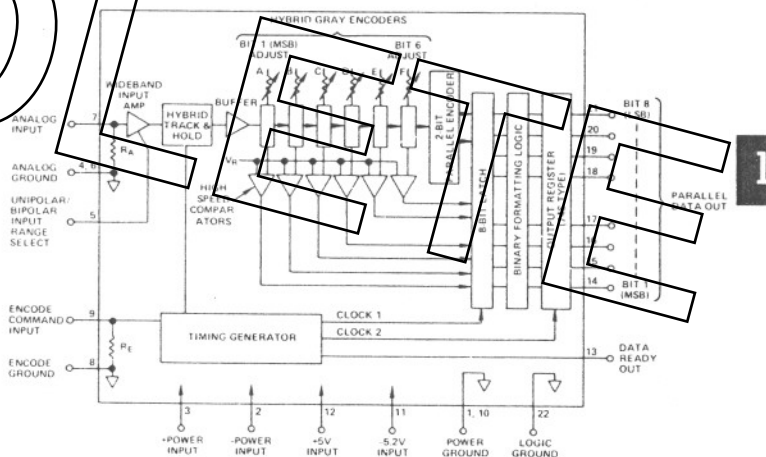


GENERAL DESCRIPTION

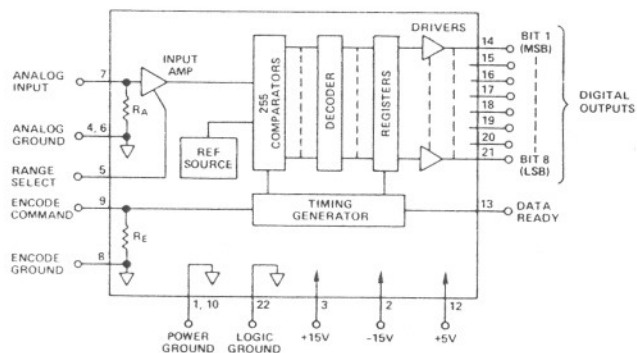
The Analog Devices' MATV series of A/D converters represent a major breakthrough in high-speed A/D technology. Providing conversion word rates from dc to 11MHz, 16MHz and 20MHz the MATV-0811, MATV-0816 and MATV-0820 are the lowest cost A/D converters in their performance class. As complete devices, they require only the addition of external power to accomplish precision video A/D conversion.

The use of internal hybrid microcircuit construction allows these modular A/D's to occupy a volume of only 21 cubic inches. They are housed in metal cases which not only shield the circuits from external RF interference, but aid in efficient heat dissipation. A choice of analog input voltages is available, including the industry standard 0 to +1V at 75Ω. The encode command input, data ready output, and the digital bit outputs are all TTL compatible. Designed to operate from either ±12V or ±15V analog and +5V digital supplies (MATV-0811 and MATV-0816 also require -5.2V), the MATV series dissipate less than 8 watts. Their weight is < 10 ounces due to enclosure rather than encapsulation. This technique facilitates rapid, inexpensive factory repair and aids in reliable printed circuit board mounting by the customer without extensive mechanical constraints or system engineering.

Relative dc accuracy is 0.2% of full scale $\pm 1/2$ LSB when operating over the frequency range of dc to 20MHz. The MATV series is designed to digitize color television signals at rates up to 20MHz and is also ideally suited for other analog to digital conversion requirements, such as radar signal processing, laser pulse analysis, transient analysis, and medical electronics applications where real-time analysis and display of large quantities of information are required.



MATV-0811, MATV-0816 Block Diagram



R_A and R_E ARE DETERMINED BY THE ANALOG INPUT IMPEDANCE AND ENCODE COMMAND INPUT IMPEDANCE, RESPECTIVELY.

MATV-0820 Block Diagram

SPECIFICATIONS

(typical @ +25°C and nominal power supply voltages unless otherwise noted)

MODEL	UNITS	MATV-0811	MATV-0816	MATV-0820
RESOLUTION (FS = Full Scale)	Bits/% FS	8/0.4	*	*
LSB Weight	% FS	0.4	*	*
ACCURACY (relative) at dc	typ	±0.15% ±1/2LSB	* ¹	*
	max	±0.2% ±1/2LSB	* ¹	*
Monotonicity		GUARANTEED	*	*
Differential Nonlinearity vs Temperature	% FS/°C	0.01	*	0.005
Linearity and Gain vs Temperature	% FS/°C	0.02	*	0.01
DYNAMIC CHARACTERISTICS				
AC Linearity @ Encode Rate ²	MHz	11	15	20
Analog Input Frequency				
DC to 3.6MHz	Spurious Signals are			
	> dB below FS	50	*	*
3.6MHz to 5.5MHz		45	*	*
Conversion Rate (Encode Word Rate)	MHz max	11	16 ¹	20
Conversion Time ³	ns	150±20	120±20	35 ±10 + 1/Encode Rate
Aperture Uncertainty (Jitter)	ps max	±30	*	*
Aperture Time	ns	3	*	12
Signal to Noise Ratio				
(rms signal to rms noise)	dB min	48	*	*
(peak signal to rms noise)	dB min	58	*	*
Noise Power Ratio	dB min	37	*	*
Transient Response	ns	50	*	*
Overvoltage Recovery Time ⁶	ns	60	*	*
Differential Gain ⁷	%	3	*	*
Differential Phase	Degrees	1	*	*
Bandwidth				
Small Signal 3dB	MHz	20	*	*
Large Signal 3dB	MHz	15	*	*
Flat ±0.1dB, dc through	MHz	1.5	*	*
INPUT ⁸				
Voltage Range				
Unipolar (Pin 5 Grounded)	V	0 to 1	*	*
Bipolar (Pin 5 open)	V	±0.5	*	*
Impedance (Terminated to Ground)	Ω	75	*	*
ENCODE COMMAND INPUT ⁸				
Logic Levels, TTL Compatible		"0" = 0 to +0.4V	*	*
		"1" = +2.4V to +5V	*	*
Impedance (terminated to ground)	Ω	75 ±5%	*	*
Rise and Fall Times (10% to 90%) max	ns	10	*	*
Duration/Width 50% points (see timing diagram)	ns min	10	*	20
	ns max	50% duty cycle	40	*
Frequency (random or periodic)	dc to MHz	11	16	20
DIGITAL DATA OUTPUT ⁸				
Format			Eight Parallel Bits NRZ	
Logic Levels, TTL			(Same as Encode Command)	
Drive Capability (not short circuit protected)	TTL Loads	10 Std	10 Schottky	
Time Skew	ns max	15	10	10
Coding			Straight Binary (BIN)	
DATA READY OUTPUT				
Format ⁹		RZ	*	*
Logic Levels, TTL			(Same as Encode Command)	
Drive Capability		10 Std	10 Schottky	
Width	ns	40±10	35±5	25±5
POWER REQUIREMENTS ¹⁰				
MATV-0811, MATV-0816/MATV-0820				
+15V ±2%/+11.8V to +15.5V	mA max	210	*	70
-15V ±2%/-11.8V to -15.5V	mA max	180	*	400
+5V ±5%/+5V +5%	mA max	450	540	200
-5.2V ±5%	mA max	280	*	N/A
TEMPERATURE RANGE				
Operating (case)	°C	0 to +70	*	*
Storage	°C	-55 to +85	*	*

*Same as MATV-0811.

NOTES

¹ Applies to a customer specified operating frequency, ±10%. Outside this range, accuracy may degrade to ±0.3% ±1/2LSB.

² AC linearity expressed in terms of spurious in-band signals generated at specified encode rates.

³ Pipeline delay not related to encode rate.

⁴ DC to 5MHz while noise BW with slot frequency at 500kHz.

⁵ Time to achieve 8-bit (0.2%) accuracy after F.S. step input.

⁶ For signals not exceeding 10% overvoltage, the A/D will recover to 8-bit accuracy within 60ns after the signal returns to the specified range. Overvoltage inputs greater than 150% of F.S. may damage input circuits and should be avoided.

⁷ At maximum encode rate, 20 IRE unit subcarrier, not including quantization effects.

⁸ Consult factory for other voltage, impedance and logic level options.

⁹ The leading edge of the data ready pulse occurs approximately 10ns before output data changes. The trailing edge is recommended for strobing data into external circuits.

⁹ For MATV-0811, the leading edge of the Data Ready pulse occurs approximately 15ns before output data changes. The trailing edge is recommended for strobing data into external circuits.

For MATV-0816, the leading edge of the Data Ready pulse occurs approximately 10ns before output data changes. The trailing edge is recommended for strobing data into external circuits.

For MATV-0820, the leading edge of the Data Ready pulse occurs approximately simultaneously with output data changes. The trailing edge is recommended for strobing data into external circuits. This provides a minimum of 20ns set-up time for external registers.

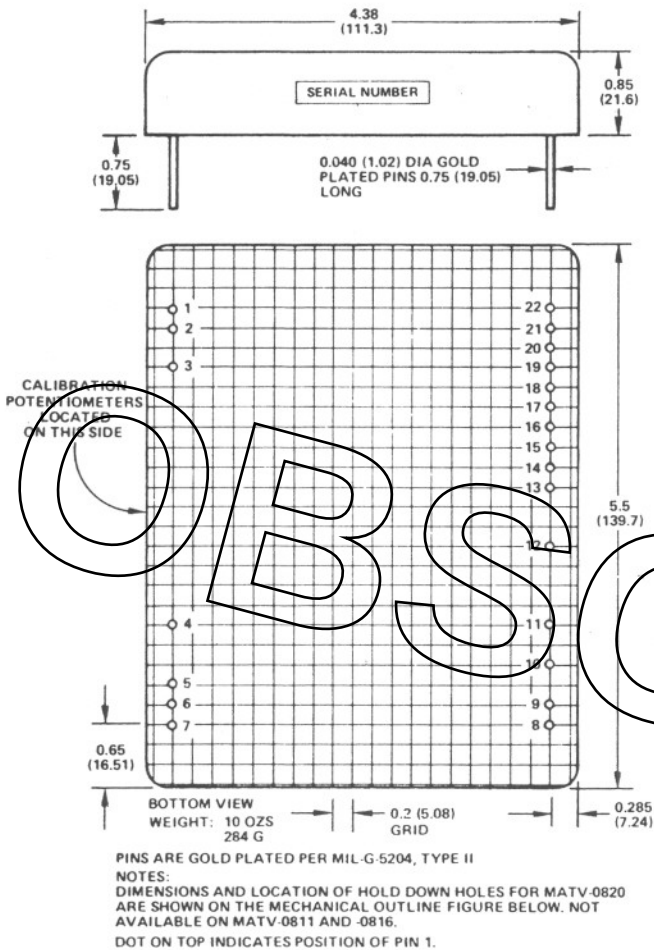
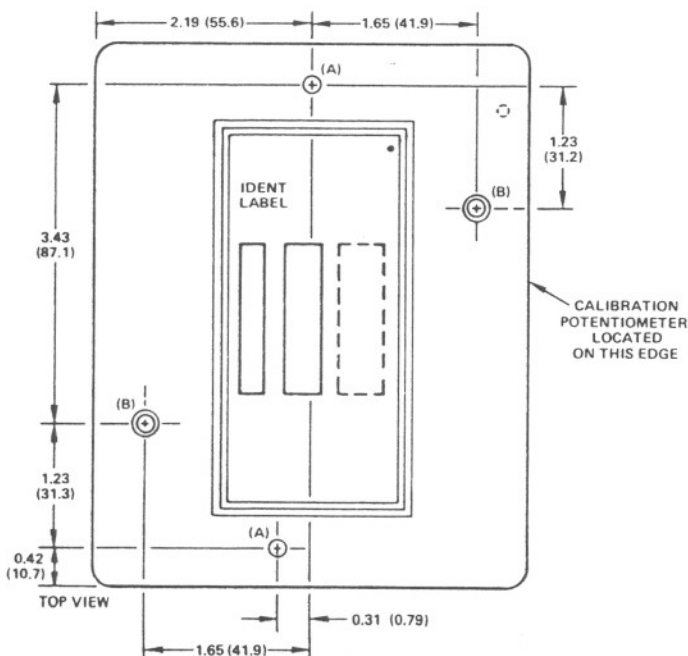
¹⁰ The A/D's are calibrated at the factory at either ±12V or ±15V as a no-cost option. Other operating voltages within this range may be specified by the user at slight additional cost.

See application section for more information.

Specifications subject to change without notice.

MECHANICAL OUTLINE AND DIMENSIONS

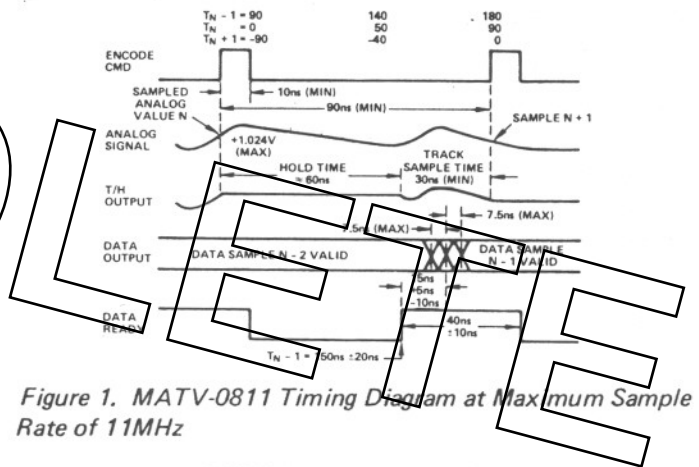
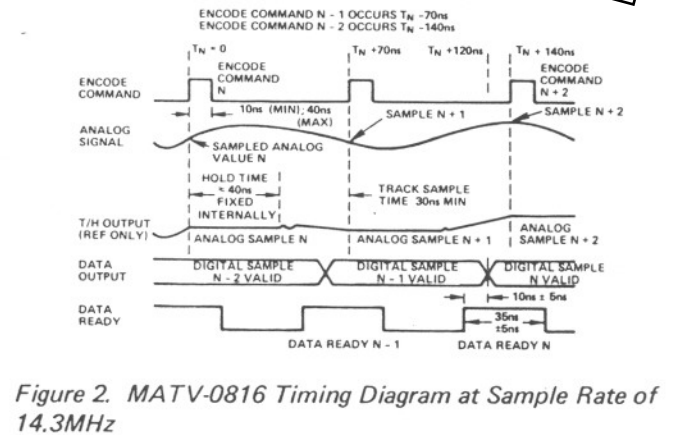
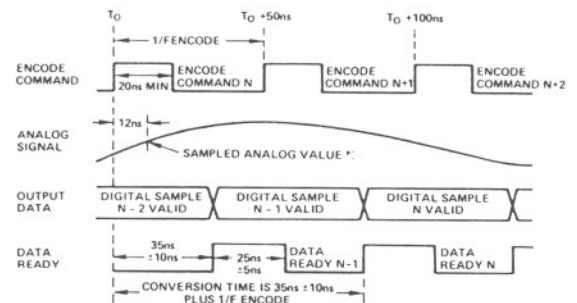
Dimensions shown in inches and (mm).



MATV SERIES PIN DESIGNATIONS

PIN	FUNCTION	COMMENTS
1	POWER GROUND	•
2	POWER INPUT	• -11.8V (MIN); -16.5V (MAX)
3	+ POWER INPUT	• +11.8V (MIN); +16.5V (MAX)
4	ANALOG GROUND	•
5	RANGE SELECT	• UNIPOLAR = GROUND • BIPOLAR = OPEN
6	ANALOG GROUND	•
7	ANALOG INPUT	• OPTIONAL
8	ENCODE GROUND	•
9	ENCODE COMMAND	• TTL, +5V (MAX)
10	POWER GROUND	•
11	NO CONNECTION 0820 -5.2V POWER INPUT 0811, 0816	• -5V (MIN), -5.5V (MAX) • +4.75V (MIN); +6.25V (MAX)
12	+5V POWER INPUT	•
13	DATA READY OUTPUT	• TTL LEVELS
14	BIT 1 OUTPUT (MSB)	• TTL LEVELS
15	BIT 2 OUTPUT	• TTL LEVELS
16	BIT 3 OUTPUT	• TTL LEVELS
17	BIT 4 OUTPUT	• TTL LEVELS
18	BIT 5 OUTPUT	• TTL LEVELS
19	BIT 6 OUTPUT	• TTL LEVELS
20	BIT 7 OUTPUT	• TTL LEVELS
21	BIT 8 OUTPUT (LSB)	• TTL LEVELS
22	DIGITAL LOGIC GND.	•

*ALL GROUNDS ARE INTERNALLY CONNECTED



NOTE:
2 ENCODE COMMAND PULSES ARE REQUIRED TO OBTAIN FIRST "DATA READY".

Figure 3. MATV-0820 Timing Diagram Shown at an Encode Frequency of 20MHz

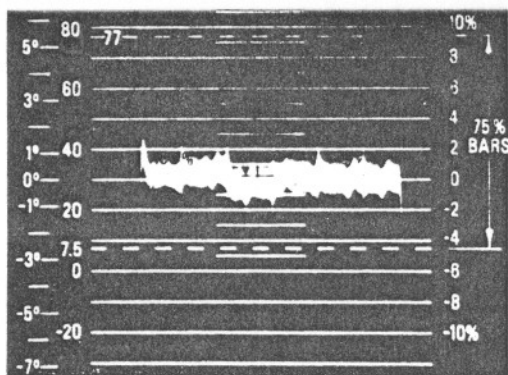


Figure 4. Typical Differential Gain of MATV-0816 Operating at 15MHz Word Rates

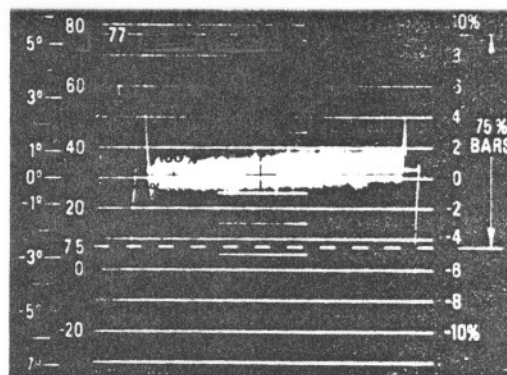


Figure 5. Typical Differential Phase of MATV-0816 Operating at 15MHz Word Rates

ORDERING INFORMATION

Each MATV series A/D converter will be calibrated at $\pm 15V$ as a standard. Order by model number either MATV-0811, MATV-0816 or MATV-0820.

Optional Versions

The MATV series A/D's are available with a variety of options, including analog input range and impedance, encode command input impedance, encode word rate, power supply voltage calibration, etc. Any option other than what is shown on the data sheet will have longer delivery, since each non-standard device is built on a per order basis.

A complete listing of optional designators is available from either the factory or your local Analog Devices' sales office.

Device Marking

The MATV series A/D that you order will be marked with a series of alphanumeric characters which specifically designate the options built into the device. For the standard devices, these will be as follows:

MATV-0811 will be marked MATV-0811-1-BIN-15 for older devices, or MATV-0811-AA150 for newer devices.

MATV-0816 will be marked MATV-0816-0175 BIN 75143150 for older devices, or MATV-0816 ABBA143150 for newer devices.

MATV-0820 will be marked MATV-0820-0175 BIN 75 for older devices, or MATV-0820 ABAA for newer devices.

This information is provided so that there will be no confusion as to why information other than the basic model number appears on the device identification label, which might cause problems at a customer's incoming inspection.