

AN8124K

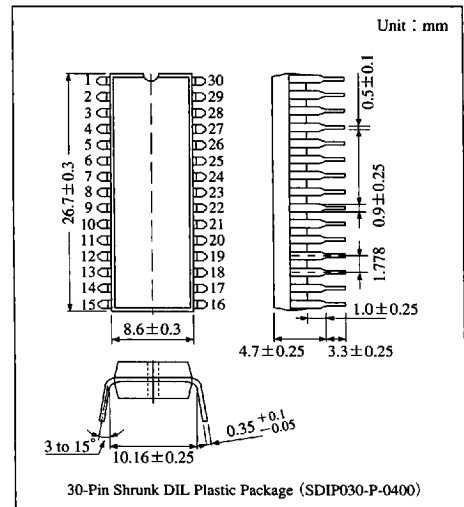
High-speed 8-bit A/D and D/A Converter IC

Overview

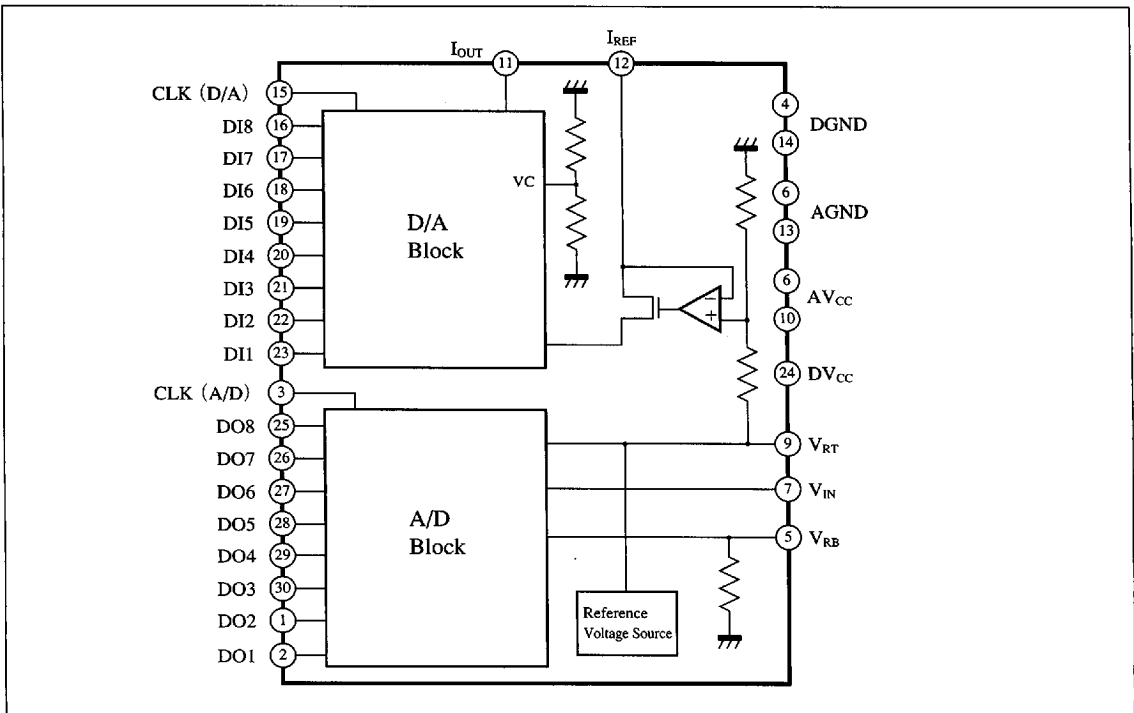
The AN8124K is a Bi-CMOS LSI containing 8-bit A/D and D/A converter whose maximum conversion rate is 20MSPS. It operates on 5V single power supply and its I/O level is compatible with TTL and most suitable for digitalizing the video processing, such as VCR and TV.

Features

- 8-bit resolution
- Max. conversion rate : 20MSPS
- Power consumption : 250mW
- I/O level is compatible with TTL
- Reference power supply built-in



Block Diagram



■ Absolute Maximum Ratings (Ta=25°C)

Parameter	Symbol	Rating	Unit
Supply voltage	V _{CC}	7	V
Supply current	I _{CC}	100	mA
Power dissipation	P _D	700	mW
Operating ambient temperature	T _{opr}	-20 to +70	°C
Storage temperature	T _{stg}	-55 to +150	°C

■ Recommended Operating Range (Ta=25°C)

Parameter	Symbol	Range
Digital supply voltage	DV _{CC}	4.75V to 5.25V
Analog supply voltage	AV _{CC}	4.75V to 5.25V
A/D	Analog input voltage	V _{RB} to V _{RT}
	Clock input voltage	V _{IH}
		2.4V to DV _{CC}
	Digital output current	V _{IL}
		DGND to 0.8V
	Clock input pulse width	I _{OH}
		-1mA
D/A	Reference resistance	I _{OL}
		1mA
	Output load resistance	t _H
		25ns to
	Digital input voltage	t _L
		25ns to
	Clock input pulse width	R _{REF}
		1.8kΩ
D/A	Reference resistance	R _O
		220Ω
	Output load resistance	V _{IH}
		2.4V to DV _{CC}
	Digital input voltage	V _{IL}
		DGND to 0.8V
	Clock input pulse width	t _{WH}
		25ns to
D/A	Reference resistance	t _{WL}
		25ns to
	Output load resistance	
	Digital input voltage	
	Clock input pulse width	

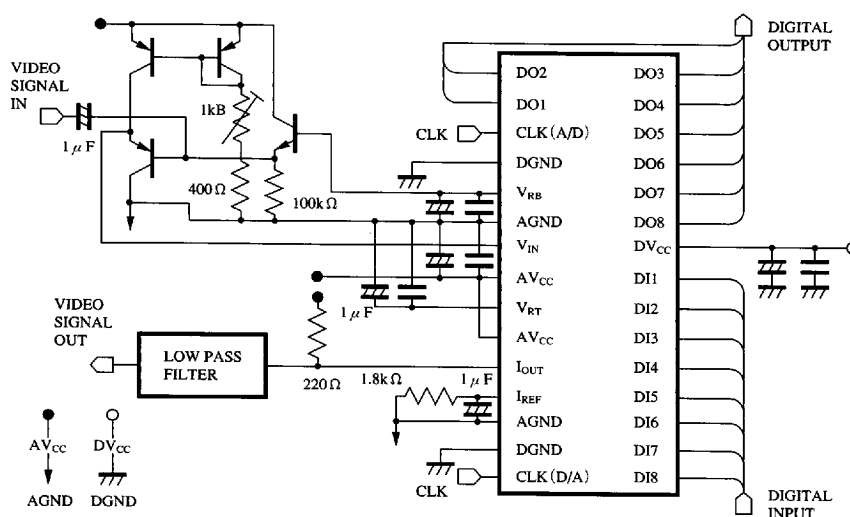
■ Electrical Characteristics (Ta=25°C)

Parameter	Symbol	Condition	min	typ	max	Unit	Note
Supply current	I _{CC}	f _{CLK} =15MHz R _{REF} =1.8kΩ	—	50	80	mA	—
Reference resistor current	I _{RT}	V _{RT} -V _{RB} =2V	—	9	20	mA	—
Reference resistor current	I _{RB}	V _{RT} -V _{RB} =2V	-20	-9	—	mA	—
Input bias current	I _{IN}	V _{IN} =2.5V	—	40	120	μA	—
Clock input current	I _{IH}	V _{IH} =2.4V	—	—	30	μA	—
Clock input current	I _{IL}	V _{IL} =0.4V	-30	—	—	μA	—
Digital output voltage	V _{OH}	I _{OH} =-2mA	V _{CC} -0.8	—	—	V	—
Digital output voltage	V _{OL}	I _{OL} =2mA	—	—	0.4	V	—
Resolution	RES		—	8	—	bit	A/D
Maximum conversion rate	F _C		20	—	—	MSPS	A/D
Linearity error	E _L	V _{RT} =3.5V V _{RB} =1.5V	—	±0.5	±1	LSB	A/D
Differential linearity error	E _D	V _{RT} =3.5V V _{RB} =1.5V	—	±0.5	±1	LSB	A/D
Resolution	RES		—	8	—	bit	D/A
Maximum conversion rate	F _C	R _{OUT} =220Ω R _{REF} =1.8kΩ	20	—	—	MSPS	D/A
Linearity error	E _L	R _{OUT} =220Ω R _{REF} =1.8kΩ	—	—	±0.5	LSB	D/A
Differential linearity error	E _D	R _{OUT} =220Ω R _{REF} =1.8kΩ	—	—	±0.5	LSB	D/A
Full-scale current	I _{FS}	R _{OUT} =220Ω R _{REF} =1.8kΩ	—	4.8	—	mA	D/A
Hold time	t _H		20	—	—	ns	D/A
Setup time	t _S		20	—	—	ns	D/A
Setting time	t _{ST}	R _{OUT} =220Ω R _{REF} =1.8Ω	—	—	50	ns	D/A

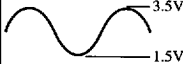
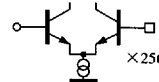
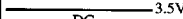
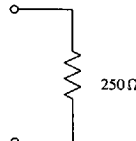
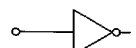
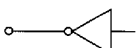
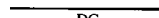
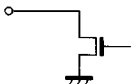
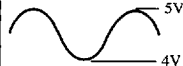
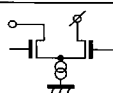
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■ Application Circuit



■ Pin Descriptions

Pin No.	Pin name	Typ. waveform	Description	I/O impedance	Equivalent circuit
24	Digital power supply		Digital power pin.	—	
4, 14	Digital GND		Digital GND pin.	—	
8, 10	Analog power supply		Analog power pin.	—	
6, 13	Analog GND		Analog GND pin.	—	
7	Analog signal input		Input pin for analog signal to A/D.	500k Ω	
9	Reference voltage high		Reference power pin. This voltage determines the upper limit of input of an analog signal to A/D.	250 Ω	
5	Reference voltage low		Reference power pin. This voltage determines the lower limit of input of an analog signal to A/D.	250 Ω	
3	A/D clock input	Refer to the timing chart.	A/D clock pin. Sampling is made at the rising edge of clock pulse.	—	
1, 2 25 to 30	A/D digital output	Same as above.	A/D digital output pin.	—	
12	A/D full-scale current adjustment		D/A full-scale current setting pin. Connect the resistor between this pin and analog GND.	—	
11	D/A current output		D/A analog output pin. Connect the load resistor (75 Ω) between this pin and analog power supply, and current is converted to voltage.	—	
15	D/A clock input	Refer to the timing chart.	D/A clock pin. Data is latched at clock rising edge.	—	
16 to 23	D/A digital data input	Same as above.	D/A digital data input pin.	—	

ICs for TV

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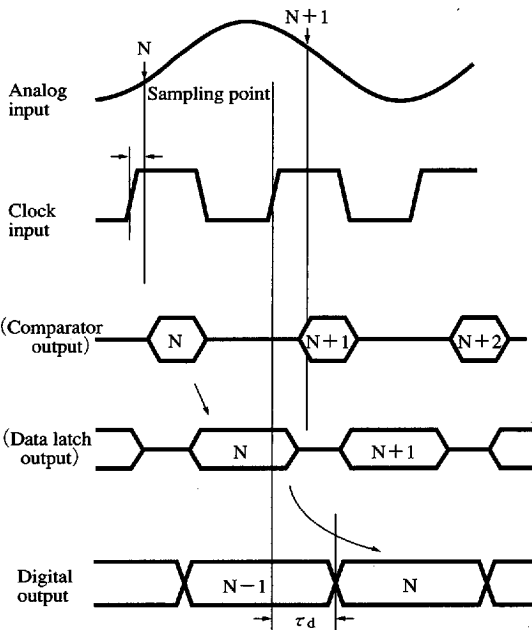
■ Supplementary Explanation

• Reference Value for Design in Electrical Characteristics (Ta=25°C)

Parameter	Symbol	Condition	min	typ	max	Unit	Note
Equivalent input impedance	R_{IN}	$V_{IN}=2.5V$	—	500	—	k Ω	A/D
Input capacitance	C_{IN}	$V_{IN}=2.5V$	—	40	—	pF	A/D
Digital output delay	τ_d		—	25	—	ns	A/D
Differential gain	DG		—	1	—	%	D/A
Differential phase	DP		—	0.5	—	deg	D/A
S/N	S/N	$f_{IN}=4MHz, f_s=20MHz$	35	40	—	dB	D/A

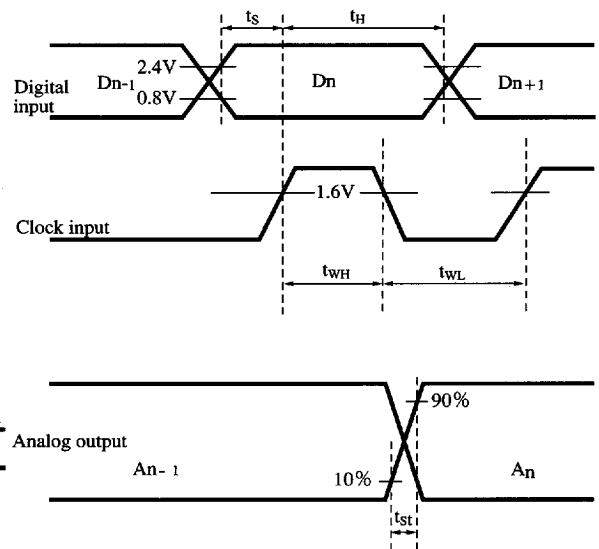
Note) The value in the above characteristics is not a guaranteed value, but reference one on design.

• A/D Sampling Timing Chart



() Items in parentheses are internal signals which cannot be observed from the outside.

• D/A Timing Chart



■ Supplementary Explanation (cont.)
• Output Code Table

Step	Input signal voltage	Digital output
	2.000V _{FS} 8.000mV STEP	M L 12345678
000	1.50000V	00000000
001	1.50800V	00000001
.	.	.
.	.	.
127	2.51600V	01111111
128	2.52400V	10000000
129	2.53200V	10000001
.	.	.
.	.	.
254	3.53200V	11111110
255	3.54800V	11111111

• Output Voltage Table

Step	Digital input	Output voltage
	Binary	V _{OUT} (V)
000	00000000	4.00000
001	00000001	4.00391
.	.	.
.	.	.
127	01111111	4.49609
128	10000000	4.50000
129	10000001	4.50391
.	.	.
.	.	.
254	11111110	4.99608
255	11111111	5.00000

ICs for
TV