PRELIMINARY	8-BIT DAC

■ DESCRIPTION

The AA88349 is a CMOS processed digital to analog converter (DAC) with 8-bit reso-lotion, low leakage and operating current. The AA88349 has 3 channels with build in operational amplifier output buffers which could operate in the full-swing voltage range from VCC to GND and enhance the Drive/Sink ability up to max. 1mA. Digital data (DI) input serially in a max. 2.5MHz clock (CLK) rate. The latched 12-bit digital data is converted into an analog DC voltage in the range from GND to VCC with 8-bit resolution in one of the 3 channels by the D/A converter in a max. 100μs settling time. AA88349 is a single 5V power DAC. Analog DC output could be full voltage swing as the analog power is equal to the system power. In addition to normal D/A converter applications, AA88349 is also available for electronic volume and instead of potentio- meters for adjustment due to its high stability on the capacitive load. 8 pins TSSOP package type are available for AA88349. Its operational temper- nature range is specified over −20℃ to 85℃.

■ FEATURES

• 12 bits serial data input (3 wire serial data transfer method, DI, CLK, LD)

• R-2R resistor ladder used for D/A conversion

• 3 channels with 8-bit resolution monotonic D/A converter

• 3 channels buffer operational amplifiers operating in the full voltage range from VCC to GND

• Max. 2.5 MHz serial digital data input

• Serial I/O for cascade application

• Max. 1.0 mA output drive/sink current

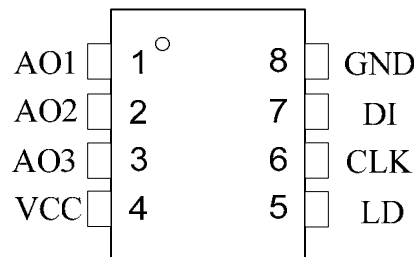• Single +5 V system power supply

■ APPLICATION

DVD, CD-R, CD-RW, DVC, digital camera, and other industrial equipments

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■ BLOCK DIAGRAM
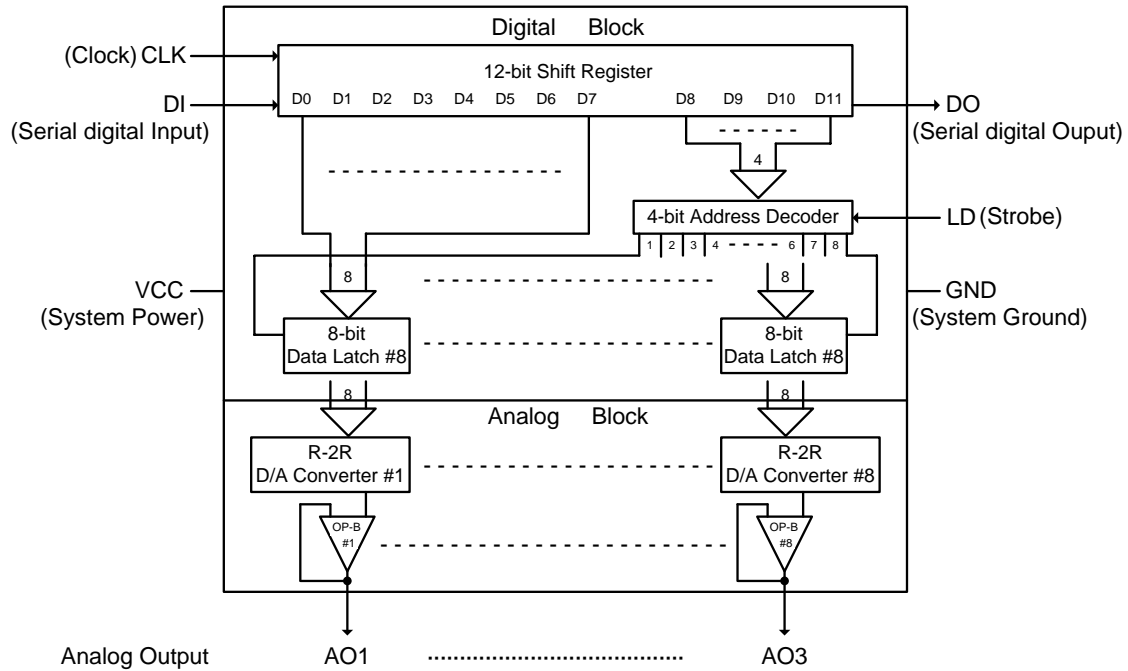
■ PIN DESCRIPTIONS

Top View

PIN NO.	PIN NAME	PIN FUNCTION
4	VCC	+5V system power supply pin .
8	GND	System ground pin
6	CLK	Serial clock input pin. At its rising edge, DI data shift into the Shift-Register.
5	LD	Data Strobe pin. When it's on high, upper 4-bit and lower 8-bit of the 12-bit in the Shift-Register be latched into the Address Decoder and the Data-Latch, respectively

AA88349

Agamem Microelectronics Inc.

PIN NO.	PIN NAME	PIN FUNCTION
Data Input		
7	D1	Serial Digital Data input pin
DAC Output		
1	AO1	8-bit D/A converter outputs
2	AO2	Output range is from GND to VCC
3	AO3	

■ DATA INPUT FORMAT
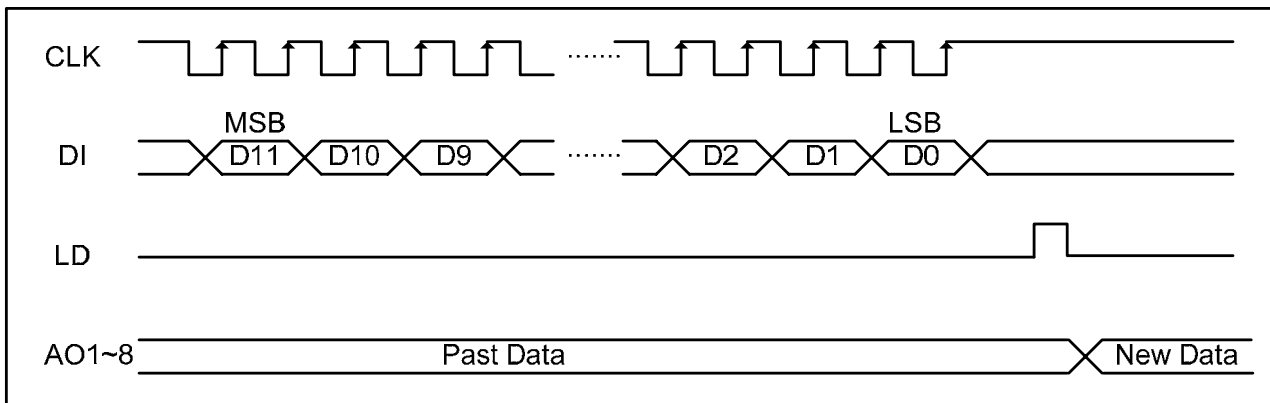
■ DATA FORMAT IN SHIFT REGISTER
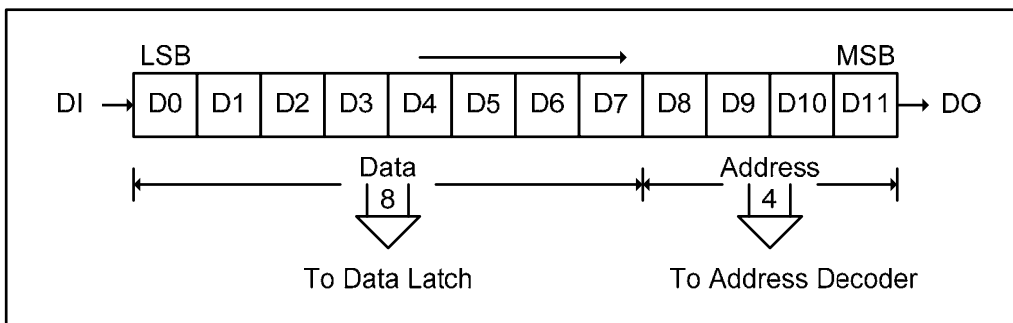
■ DATA CONVERSION

DATA								DAC OUTPUT LEVEL
D7	D6	D5	D4	D3	D2	D1	D0	AOX
0	0	0	0	0	0	0	0	GND
0	0	0	0	0	0	0	1	GND + LSB*
0	0	0	0	0	0	1	0	GND+ 2 * LSB
≀	≀	≀	≀	≀	≀	≀	≀	≀
1	1	1	1	1	1	1	0	VCC - LSB
1	1	1	1	1	1	1	1	VCC

- LSB = (VCC-GND)/255

■ CHANNEL MAP

ADDRESS

1H	D-L#1	R-2R D/A#1	OP-B#1	AO1
2H	D-L#1	R-2R D/A#2	OP-B#2	
3H	D-L#1	R-2R D/A#3	OP-B#3	
4H	D-L#1	R-2R D/A#4	OP-B#4	
5H	D-L#1	R-2R D/A#5	OP-B#5	AO2
6H	D-L#1	R-2R D/A#6	OP-B#6	AO3
7H	D-L#1	R-2R D/A#7	OP-B#7	
8H	D-L#1	R-2R D/A#8	OP-B#8	
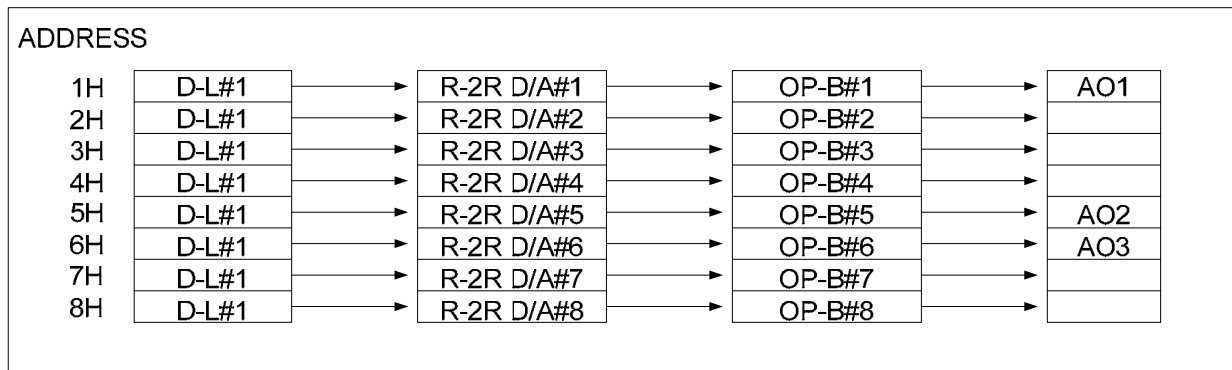
■ ADDRESS DECODING

ADDRESS				DATA LATCH SELECTED
D8	D9	D10	D11	
0	0	0	0	NA
0	0	0	1	Data Latch #1
0	0	1	0	NA
0	0	1	1	NA
0	1	0	0	NA
0	1	0	1	Data Latch #2
0	1	1	0	Data Latch #3
0	1	1	1	NA

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ADDRESS				DATA LATCH SELECTED
D8	D9	D10	D11	
1	0	0	1	NA
1	0	1	0	NA
1	0	1	1	NA
1	1	0	0	NA
1	1	0	1	NA
1	1	1	0	NA
1	1	1	1	NA

■ ABSOLUTE MAXIMUM RATINGS

Ta=25℃, unless otherwise noted

PARAMETER	SYMBOL	RATING			UNIT
		MIN	TYP	MAX	
System Voltage	VCC	-0.3	—	+7.0	V
Input Voltage	VIN	-0.3	—	VCC + 0.3	V
Output Voltage	VOUT	-0.3	—	VCC + 0.3	V
Power Dissipation	PD	—	—	250	mW
Operating Ambient Temperature	TA	-20	—	+85	℃
Storage Temperature	TS	-55	—	+150	℃

NOTE: Stress above those listed under "Absolute Maximum Rating" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational section of this specification is not implied. Exposure to absolute maximum rating conditions for the extended periods of time may affect device reliability.

■ ELECTRICAL CHARACTERISTICS

◆ RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER	CONDITIONS	LIMITS			UNIT
			MIN	TYP	MAX	
VCC	System Voltage		4.5	5.0	5.5	V
GND			—	0	—	V
IAO	Analog Output Current	VAO shift≦0.3V	-1.0	—	+1.0	mA

SYMBOL	PARAMETER	CONDITIONS	LIMITS			UNIT
			MIN	TYP	MAX	
COL	Analog Output Load Capacitance for Oscillation limit		—	—	+1.0	μF
TA	Operating Ambient Temperature		-20	—	+85	℃

◆ DC CHARACTERISTICS

Ta = 25℃

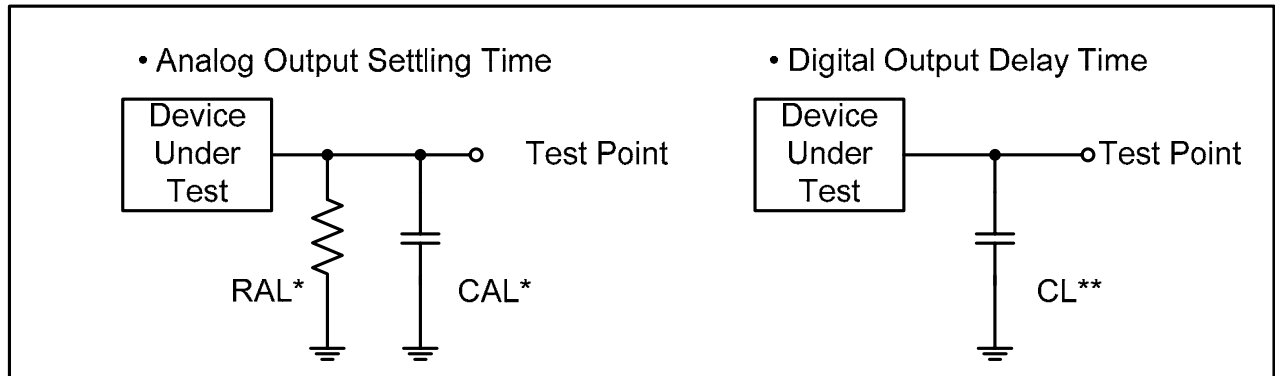| PARAMETER	SYMBOL	VALUE			UNIT	CONDITIONS
		MIN	TYP	MAX		
System Voltage	VCC	4.5	5.0	5.5	V	
System Current	ICC	—	1.2	2.5	mA	CLK = 1 MHz, No load;
Input Leakage Current	IILK	-5	—	+5	μA	VIN = 0V / 5V
Digital Input Low Voltage	VIL	—	—	0.2 · VCC	V	
Digital Input High Voltage	VIH	0.5 · VCC	—	—	V	
Digital Output Low	VOL	—	—	0.4	V	IOL = +2.5 mA
Digital Output High	VOH	VCC – 0.4	—	—	V	IOH = –400 μA

NOTES: Integral Non-Linearity: The difference between the digital data converted DC analog values and a reference straight line drawn through the first and the last output values Differential Non-Linearity: The difference between the ideal and real increment value of DC analog voltage when the digital data increase 1 bit.
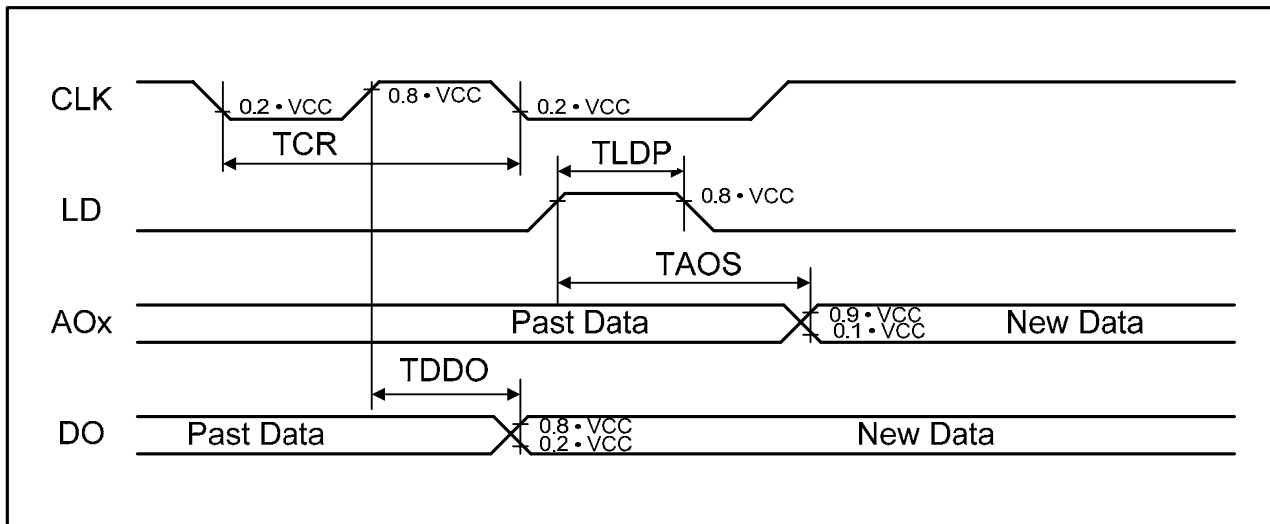
◆ **AC CHARACTERISTICS**

Ta = 25℃

PARAMETER	SYMBOL	VALUE			UNIT	CONDITIONS
		MIN	TYP	MAX		
Clock Rate	TCR	400	1000	—	ns	
Load Strobe Pulse Width	TLDP	—	200	—	ns	
Analog Output Settling Time	TAOS	—	—	100	μs	*RAL = 10 kΩ, CAL = 50pF (#00--> #FF)
Digital Output Delay Time	TDDO	—	—	350	ns	**CL = 100 pF (Max.)

AC TEST CONDITION

• Analog Output Settling Time

Device Under Test → Test Point

RAL* CAL*

• Digital Output Delay Time

Device Under Test → Test Point

CL**

TIMING CHART

CLK

$0.2 \cdot VCC$ $0.8 \cdot VCC$ $0.2 \cdot VCC$

TCR TLDP

LD $0.8 \cdot VCC$

TAOS

AOx Past Data $0.9 \cdot VCC$ / $0.1 \cdot VCC$ New Data

TDDO

DO Past Data $0.8 \cdot VCC$ / $0.2 \cdot VCC$ New Data

■ ORDERING INFORMATION

ORDER NO.	PACKAGE	PACKING	ONE REEL Q'TY	MARK CHART
AA88349A	TSSOP8L	Tape & Reel	3,000ea	88349 XXXX A

■ PACKAGE DIMENSIONS
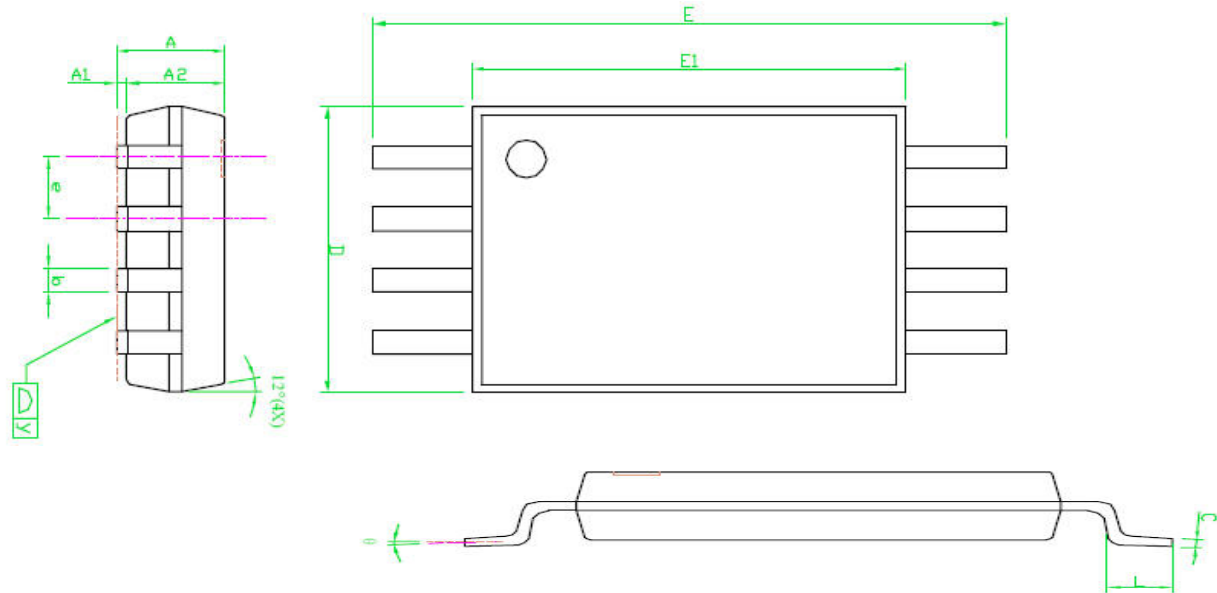
NOTES:

Package body sizes exclude mold flash protrusions or gate burrs

Tolerance ± 0.1㎜ (4 mil) unless otherwise specified

Coplanarity:0.1㎜

Controlling dimension is millimeter converted inch dimensions are not necessarily exact

Followed from jedec mo-153

SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	- - -	- - -	1.20	- - -	- - -	0.048
A1	0.05	- - -	0.15	0.002	- - -	0.006
A2	0.80	1.00	1.05	0.031	0.039	0.041
b	0.19	- - -	0.30	0.007	- - -	0.012
C	0.09	- - -	0.20	0.004	- - -	0.008
D	2.90	3.00	3.10	0.114	0.118	0.122
E	6.20	6.40	6.60	0.244	0.252	0.260
E1	4.30	4.40	4.50	0.169	0.173	0.177
e	- - -	0.65	- - -	- - -	0.026	- - -
L	0.45	0.60	0.75	0.018	0.024	0.030
y	- - -	- - -	0.10	- - -	- - -	0.004
θ	0°	- - -	8°	0°	- - -	8°