



# aAM3104

## ULTRA LOW POWER, 4-CHANNEL CMOS ANALOG MULTIPLEXER PRODUCT SPECIFICATION

### Preliminary Specification

#### General Description

The aAM3104 is a precision CMOS analog multiplexer offering low on-resistance of less than  $4\Omega$ , with better than  $0.4\Omega$  matching between channels and extremely flat resistance over the specified analog input voltage range of less than  $1.2V$ . The aAM3104 has very fast enable switching speed of less than  $20nS$  over the full operating temperature range of  $-40^{\circ}C$  to  $85^{\circ}C$ . The aAM3104 also consumes a minimal amount of power, making them ideal for portable equipment.

The aAM3104 connects 1-of-4 inputs to a common output by control of a 2-bit binary address. An enable pin disconnects all inputs from the output. The part is available in a 10-contact, leadless QFN package and operates over the range from  $1.8V$  to  $5.5V$ .

#### Features (5V $V_{DD}$ )

- Low On-Resistance:  $4\Omega$  Max
- Guaranteed On-resistance match between channels,  $< 0.4\Omega$
- Guaranteed Flat On-resistance over specified signal range,  $< 1.2V$ .
- Enable Turn-On time:  $14nS$  at  $25^{\circ}C$
- Enable Turn-Off time:  $6nS$  at  $25^{\circ}C$
- Transition Time:  $14nS$  at  $25^{\circ}C$
- Break before Make Interval:  $8nS$  at  $25^{\circ}C$
- Temperature Range:  $-40^{\circ}C$  to  $85^{\circ}C$
- Uses a Single Supply:  $3V$  to  $5V$  nominal

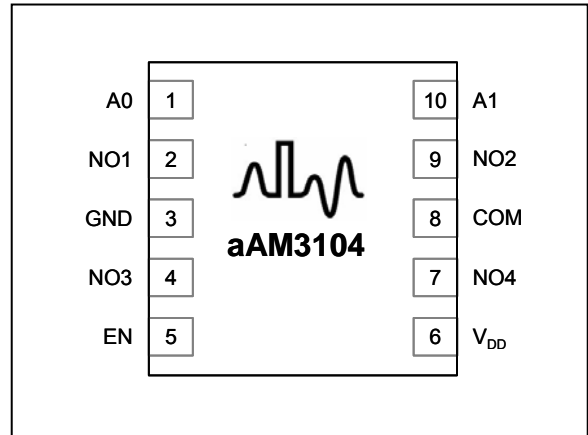
#### Applications

- Mobile Communications
- Computers and Peripherals
- Battery Management
- FAX Machines/Printers/Copiers
- Portable Medical Instruments

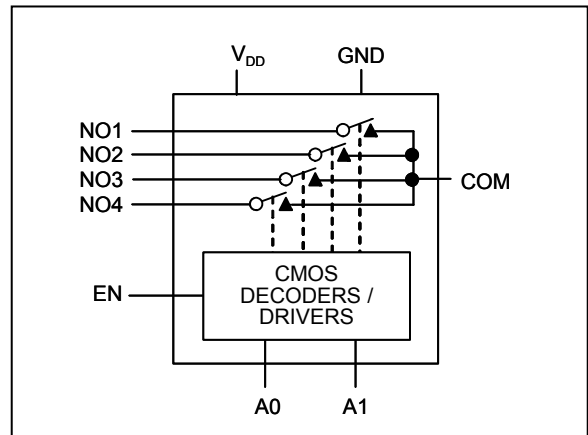
#### Ordering Information

Part Number	Package	Temperature Range	Part Marking	How Supplied
aAM3104Q10	10-Lead QFN	$-40^{\circ}C$ to $+85^{\circ}C$	aAM3104	3000 units on T&R

#### Pin Configuration



#### Functional Diagram



Preliminary Specification - Subject to change without notice

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**Absolute Maximum Ratings<sup>1</sup>**

Parameter	Rating	
Supply Voltage	+7V	
Analog Input/Output Voltage	-0.5V to $V_{DD} + 0.5V$	
Address/EN Input Voltage	-0.5V to $V_{DD} + 0.5V$	
Continuous Current, any terminal	50mA	
Storage Temperature Range	-60°C to +150°C	
Lead Soldering Temperature	260°C	
ESD <sup>2</sup>	Human Body Model	2000V
	Machine Model	250V
Thermal Resistance - $\theta_{JA}$	TBD	

**NOTES:**

1. Absolute maximum ratings are limits beyond which operation may cause permanent damage to the device. These are stress ratings only; functional operations at or above these limits is not implied.
2. Human Body Model: 100pF capacitor discharged through a 1.5k $\Omega$  resistor into each pin. Machine Model: 200pF capacitor discharged directly into each pin.
3. These specifications are guaranteed only for the test conditions listed.

**Recommended Operating Ratings**

Symbol	Parameter	Min	Max	Units
$V_{DD}$	Supply Voltage	+1.8	+5.5	V
$V_{NO}$ , $V_{COM}$	Analog Signal Level	0	$V_{DD}$	V
$T_A$	Operating Temperature Range	-40	+85	°C

**DC Electrical Characteristics (Digital section)<sup>3</sup>**

Limits apply for  $-40^\circ\text{C} \leq T_A \leq +85^\circ\text{C}$  and  $V_{DD} = +5.0V$  unless otherwise noted.

Parameter	Symbol	Conditions	Min	Max	Units
Min Hi-Level Input Voltage	$V_{IH}$	$-40^\circ\text{C} \leq T_A \leq +85^\circ\text{C}$ $V_{DD} = +2.7V$ $V_{DD} = +4.5V$	2.0V 2.4V		V
Max Low-Level Input Voltage	$V_{IL}$	$-40^\circ\text{C} \leq T_A \leq +85^\circ\text{C}$ $V_{DD} = +2.7V$ $V_{DD} = +4.5V$		0.4V 0.8V	V
Digital Input Leakage	$I_{IN}$	$V_{ADD} \& V_{EN} = 0V$ or $+5.5V$ $V_{DD} = +5.5V$	$T_A = +25^\circ\text{C}$ $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$	-0.1 -1.0	0.1 1.0 $\mu\text{A}$

**DC Electrical Characteristics (Analog Section)<sup>3</sup>**

Limits apply for  $-40^\circ\text{C} \leq T_A \leq +85^\circ\text{C}$  and  $V_{DD} = +5.0V$  unless otherwise noted.

Parameter	Symbol	Conditions	Min	Typ	Max	Units
ON-Resistance	$R_{ON}$	$I_{NO} = -10\text{mA}$ $V_{COM} = 0V$ to $V_{DD}$ $T_A = +25^\circ\text{C}$ $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$		2	4	$\Omega$
		$V_{DD} = +3V$ , $I_{NO} = -10\text{mA}$ $V_{COM} = 0V$ to $V_{DD}$ $T_A = +25^\circ\text{C}$ $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$		4	7	$\Omega$
ON-Resistance channel matching	$\Delta R_{ON}$	$I_{NO} = -10\text{mA}$ , $V_{DD} = +4.5V$ $V_{COM} = 0$ to $V_{DD}$ $T_A = +25^\circ\text{C}$ $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$		0.1	0.4	$\Omega$
		$I_{NO} = -10\text{mA}$ , $V_{DD} = +2.7V$ $V_{COM} = 0$ to $V_{DD}$ $T_A = +25^\circ\text{C}$ $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$		0.1	0.4	$\Omega$
ON-Resistance Flatness	$R_{FLAT}$	$I_{NO} = -10\text{mA}$ , $V_{DD} = +5V$ $V_{COM} = 0$ to $V_{DD}$ $T_A = +25^\circ\text{C}$ $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$		0.75	1.2	$\Omega$
		$I_{NO} = -10\text{mA}$ , $V_{DD} = +3V$ $V_{COM} = 0$ to $V_{DD}$ $T_A = +25^\circ\text{C}$ $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$		1.2	3	$\Omega$
Supply Current	$I_{DD}$	$V_{DD} = +3.3V$ or $+5.5V$ , $V_{ADD} \& V_{EN} = 0V$ or $V_{DD}$ $T_A = +25^\circ\text{C}$ $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$		0.1	1	$\mu\text{A}$

### Dynamic Electrical Characteristics<sup>3</sup>

Limits apply for  $-40^{\circ}\text{C} \leq T_A \leq +85^{\circ}\text{C}$  and  $V_{DD} = +5.0\text{V}$  unless otherwise noted.

Parameter	Symbol	Conditions		Min	Typ	Max	Units
Transition Time	$t_{\text{TRANS}}$	$V_{DD} = +5\text{V}, V_{NO} = 3\text{V}$ $C_L = 35\text{pF}, R_L = 300\Omega$	$T_A = +25^{\circ}\text{C}$ $T_A = -40^{\circ}\text{C to } +85^{\circ}\text{C}$		12	20	ns
		$V_{DD} = +3\text{V}, V_{NO} = 2\text{V}$ $C_L = 35\text{pF}, R_L = 300\Omega$	$T_A = +25^{\circ}\text{C}$ $T_A = -40^{\circ}\text{C to } +85^{\circ}\text{C}$		17	24	ns
Break-Before-Make Interval	$t_{\text{OPEN}}$	$V_{DD} = +5\text{V}, V_{NO} = 3\text{V}$ $C_L = 35\text{pF}, R_L = 300\Omega$	$T_A = +25^{\circ}\text{C}$ $T_A = -40^{\circ}\text{C to } +85^{\circ}\text{C}$	1	3		ns
		$V_{DD} = +3\text{V}, V_{NO} = 2\text{V}$ $C_L = 35\text{pF}, R_L = 300\Omega$	$T_A = +25^{\circ}\text{C}$ $T_A = -40^{\circ}\text{C to } +85^{\circ}\text{C}$	1	3		
Enable Turn-On Time	$t_{\text{ON(EN)}}$	$V_{DD} = +5\text{V}, V_{NO} = 3\text{V}$ $C_L = 35\text{pF}, R_L = 300\Omega$	$T_A = +25^{\circ}\text{C}$ $T_A = -40^{\circ}\text{C to } +85^{\circ}\text{C}$		10	20	ns
		$V_{DD} = +3\text{V}, V_{NO} = 2\text{V}$ $C_L = 35\text{pF}, R_L = 300\Omega$	$T_A = +25^{\circ}\text{C}$ $T_A = -40^{\circ}\text{C to } +85^{\circ}\text{C}$		13	24	ns
Enable Turn-Off Time	$t_{\text{OFF(EN)}}$	$V_{DD} = +5\text{V}, V_{NO} = 3\text{V}$ $C_L = 35\text{pF}, R_L = 300\Omega$	$T_A = +25^{\circ}\text{C}$ $T_A = -40^{\circ}\text{C to } +85^{\circ}\text{C}$		7	13	ns
		$V_{DD} = +3\text{V}, V_{NO} = 2\text{V}$ $C_L = 35\text{pF}, R_L = 300\Omega$	$T_A = +25^{\circ}\text{C}$ $T_A = -40^{\circ}\text{C to } +85^{\circ}\text{C}$		10	16	ns
Logic Input Cap.	$C_{\text{IN}}$	$f = 1\text{MHz}$	$T_A = +25^{\circ}\text{C}, f = 1\text{MHz}$		8		pF
NO-off-ch Cap.	$C_{\text{NO(OFF)}}$	$f = 1\text{MHz}; V_{\text{EN}} = V_{\text{NO}} = 0\text{V}$	$T_A = +25^{\circ}\text{C}, f = 1\text{MHz}$		8		pF
COM-Off-ch Cap.	$C_{\text{COM(OFF)}}$	$V_{\text{EN}} = +0.8\text{V}; V_{\text{COM}} = 0\text{V}$	$T_A = +25^{\circ}\text{C}, f = 1\text{MHz}$		50		pF
COM-On-ch Cap.	$C_{\text{COM(ON)}}$	$V_{\text{EN}} = +2.4\text{V}; V_{\text{COM}} = 0\text{V}$	$T_A = +25^{\circ}\text{C}, f = 1\text{MHz}$		60		pF

### Test Circuits / Timing Diagrams

Figure 1. Enable Switching Time

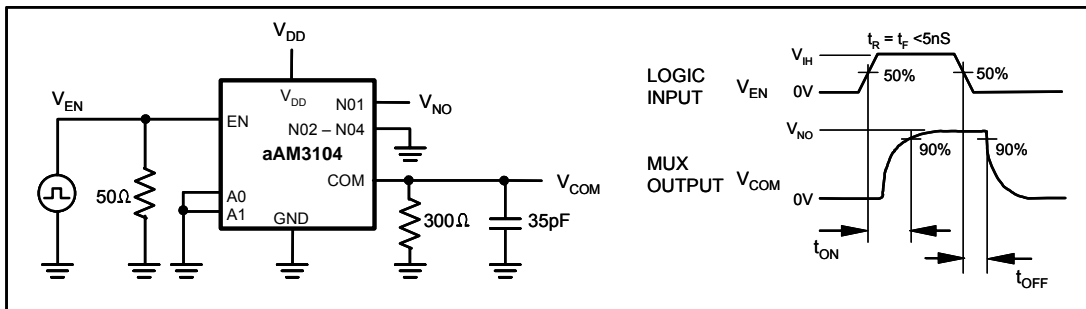
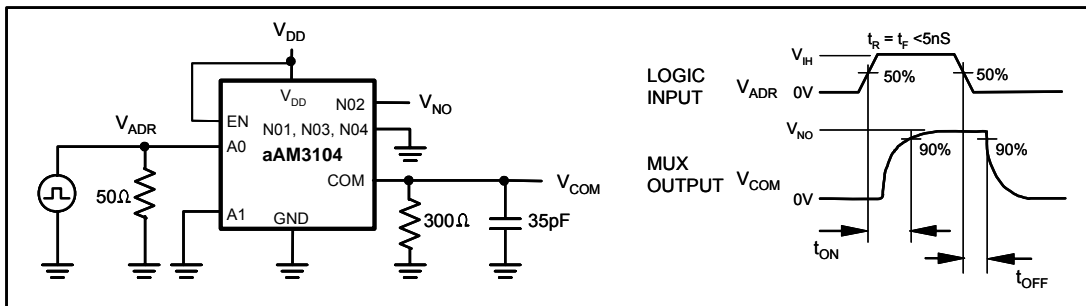
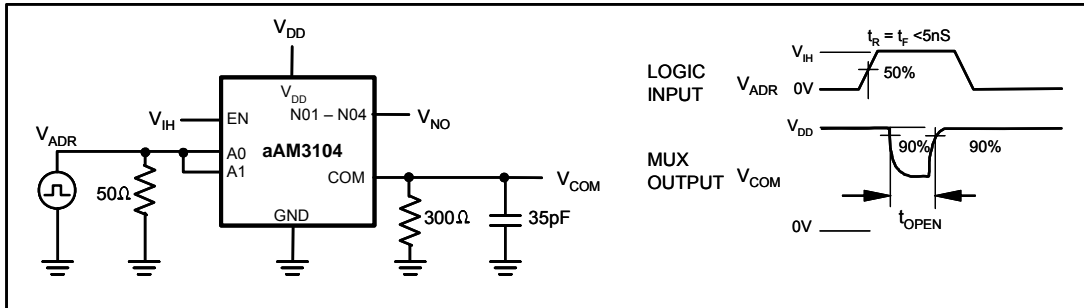


Figure 2. Transition Time



Test Circuits / Timing Diagrams (Cont'd)

Figure 3. Break-Before-Make Time



Truth Table

A1	A0	EN	ON Switch
X	X	0	None
0	0	1	1
0	1	1	2
1	0	1	3
1	1	1	4

Logic "0"  $V_{IL} \leq 0.8V$ , Logic "1"  $\geq 2.4V$



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