



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 4Ω , with better than 0.4Ω matching between channels and extremely flat resistance over the specified analog input voltage range of less than 1.2Ω . The aAM3104 has very fast enable switching speed of less than 20nS over the full operating temperature range of -40°C to 85°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: 4Ω Max
- Guaranteed On-resistance match between channels, $< 0.4\Omega$
- Guaranteed Flat On-resistance over specified signal range, $< 1.2\Omega$.
- Enable Turn-On time: 14nS at 25°C
- Enable Turn-Off time: 6nS at 25°C
- Transition Time: 14nS at 25°C
- Break before Make Interval: 8nS at 25°C
- Temperature Range: -40°C to 85°C
- Uses a Single Supply: 3V to 5V nominal

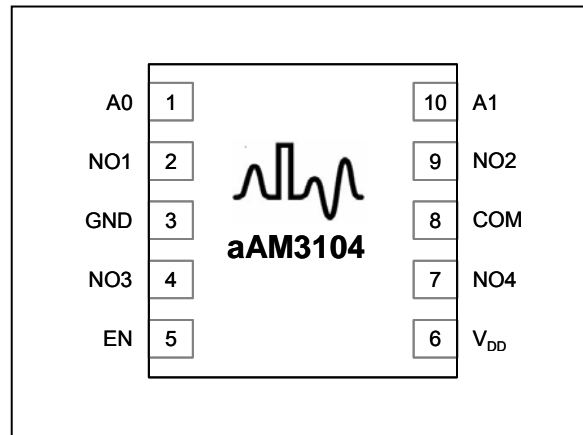
Applications

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

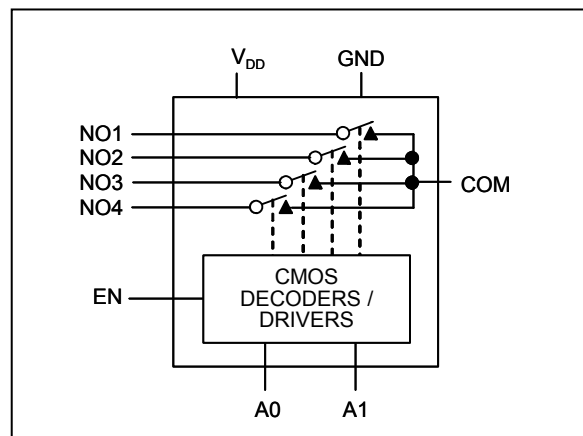
Ordering Information

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

Pin Configuration



Functional Diagram



Absolute Maximum Ratings¹

| 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 ² | Human Body Model | 2000V |
| | Machine Model | 250V |
| Thermal Resistance - θ_{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 Ω 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)³

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 μA |

DC Electrical Characteristics (Analog Section)³

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 | Ω |
| | | $V_{DD} = +3V$, $I_{NO} = -10\text{mA}$ $V_{COM} = 0V$ to V_{DD} $T_A = +25^\circ\text{C}$ $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$ | | 4 | 7 | Ω |
| ON-Resistance channel matching | ΔR_{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 | Ω |
| | | $I_{NO} = -10\text{mA}$, $V_{DD} = +2.7V$ $V_{COM} = 0$ to V_{DD} $T_A = +25^\circ\text{C}$ $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$ | | 0.1 | 0.4 | Ω |
| 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 | Ω |
| | | $I_{NO} = -10\text{mA}$, $V_{DD} = +3V$ $V_{COM} = 0$ to V_{DD} $T_A = +25^\circ\text{C}$ $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$ | | 1.2 | 3 | Ω |
| 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 | μA |

Dynamic Electrical Characteristics³

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_{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_{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_{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

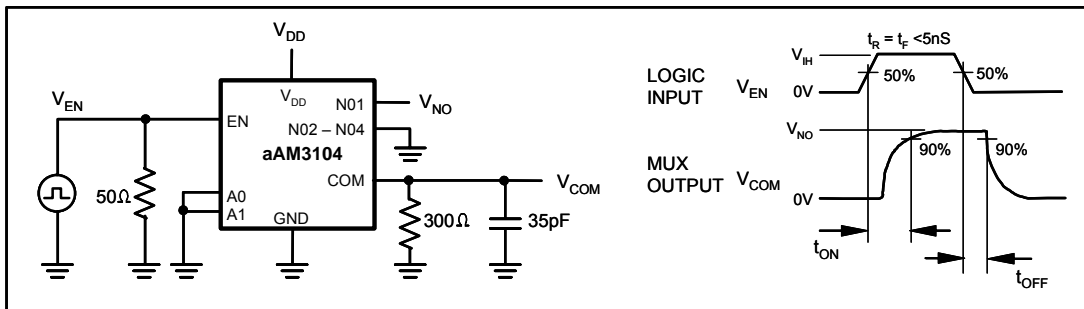
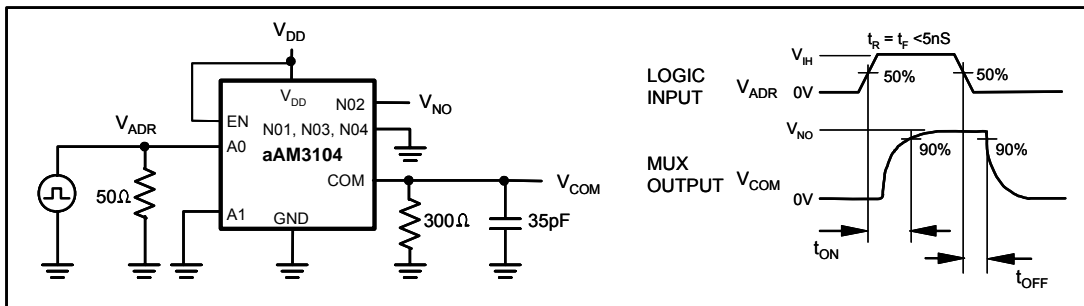
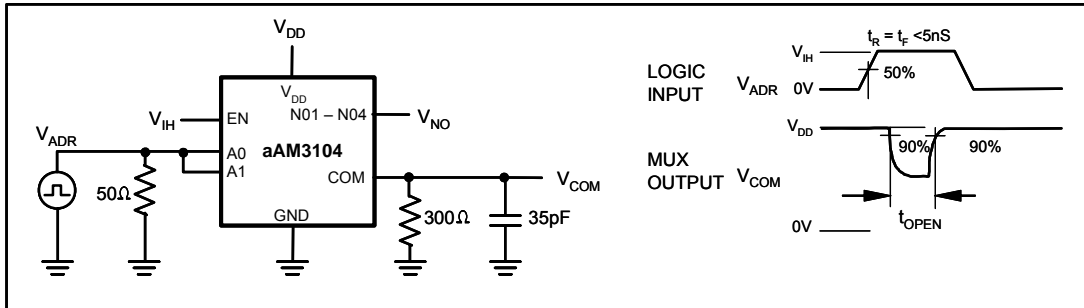


Figure 2. Transition Time



Test Circuits / Timing Diagrams (Cont'd)

Figure 3. Break-Before-Make Time

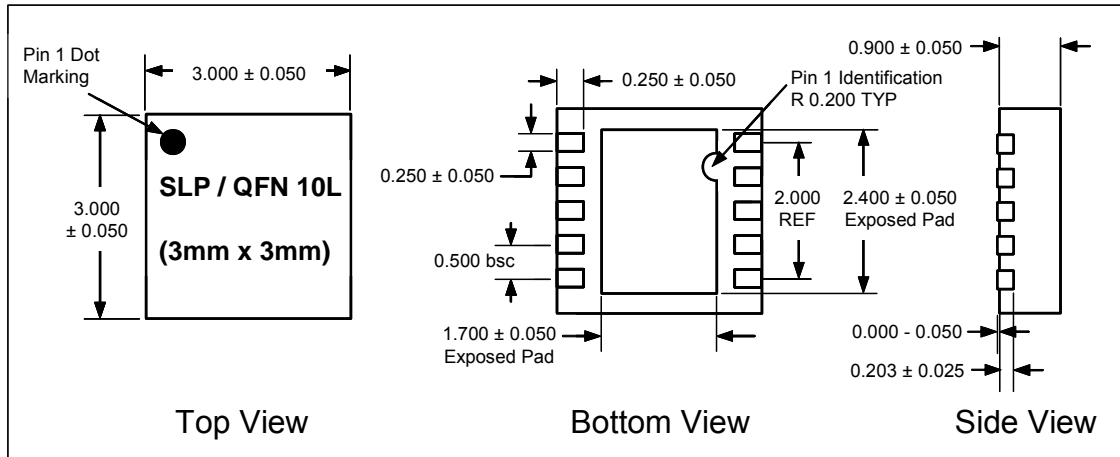


Truth Table

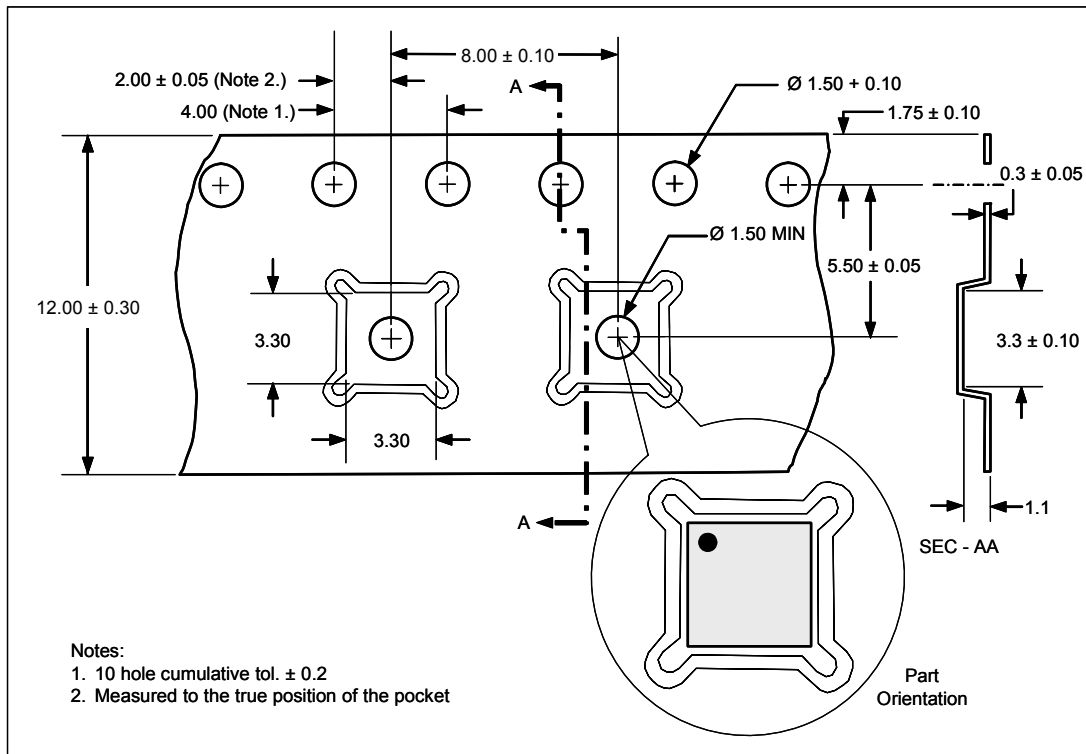
| A1 | A0 | EN | ON Switch |
|----|----|----|-----------|
| X | X | 0 | None |
| 0 | 0 | 1 | 1 |
| 0 | 1 | 1 | 2 |
| 1 | 0 | 1 | 3 |
| 1 | 1 | 1 | 4 |

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

QFN-10 Package Dimensions



Tape & Reel Dimensions



Preliminary Specification - Subject to change without notice

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