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# 74AUP1G96

## TinyLogic® Low Power Universal Configurable Two-Input Logic Gate (Open Drain Output)

### Features

- 0.8 V to 3.6V  $V_{CC}$  Supply Operation
- 3.6 V Over-Voltage Tolerant I/Os at  $V_{CC}$  from 0.8 V to 3.6 V
- Extremely High Speed  $t_{PD}$   
- 3.2 ns: Typical at 3.3 V
- Power-Off High-Impedance Inputs and Outputs
- Low Static Power Consumption  
-  $I_{CC}=0.9 \mu A$  Maximum
- Low Dynamic Power Consumption  
-  $C_{PD}=3.0$  pF Typical at 3.3 V
- Ultra-Small MicroPak™ Packages

### Description

The 74AUP1G96 is a universal configurable, two-input logic gate with an open-drain output that provides a high-performance and low-power solution for battery-powered portable applications. This product is designed for a wide low voltage operating range (0.8 V to 3.6 V) and guarantees very low static and dynamic power consumption across the entire voltage range. All inputs are implemented with hysteresis to allow for slower transition input signals and better switching noise immunity.

The 74AUP1G96 provides for multiple functions as determined by various configurations of the three inputs. The potential logic functions provided are MUX, AND, OR, NAND, and, NOR inverter and buffer (see *Figure 2 to Figure 8*).

### Ordering Information

Part Number	Top Mark	Package	Packing Method
74AUP1G96L6X	AP	6-Lead, MicroPak™ 1.0 x 1.45mm, JEDEC MO-252	5000 Units on Tape & Reel
74AUP1G96FHX	AP	6-Lead, MicroPak2™, 1x1mm Body, .35mm Pitch	5000 Units on Tape & Reel

## Pin Configurations

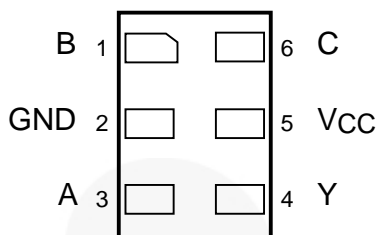


Figure 1. MicroPak™ (Top Through View)

## Pin Definitions

Pin #	Name	Description
1	B	Data Input
2	GND	Ground
3	A	Data Input
4	Y	Output (Open Drain)
5	V <sub>CC</sub>	Supply Voltage
6	C	Data Input

## Function Table

Inputs			Y=Output
C	B	A	
L	L	L	H <sup>(1)</sup>
L	L	H	H <sup>(1)</sup>
L	H	L	L
L	H	H	L
H	L	L	H <sup>(1)</sup>
H	L	H	L
H	H	L	H <sup>(1)</sup>
H	H	H	L

H = HIGH Logic Level

L = LOW Logic Level

**Note:**

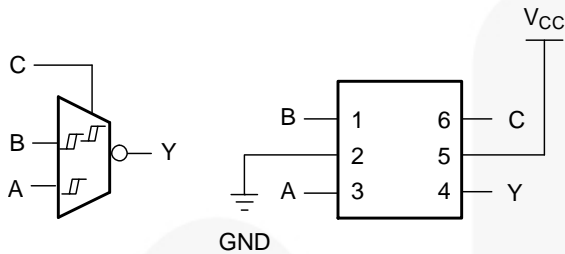
1. High impedance output state, open drain.

2-Input Logic Function	Connection Configuration
2-to-1 MUX with Inverted Output	Figure 2
2-Input NAND Gate	Figure 3
2-Input NOR Gate with One Inverted Input	Figure 4
2-Input AND Gate with One Inverted Input	Figure 4
2-Input NAND Gate with One Inverted Input	Figure 5
2-Input OR Gate with One Inverted Input	Figure 5
2-Input NOR Gate	Figure 6
Buffer	Figure 7
Inverter	Figure 8

## Logic Configurations

Figure 2 through Figure 8 show the logical functions that can be implemented using the 74AUP1G98. The diagrams show the DeMorgan's equivalent logic duals for a given two-input function. The logical

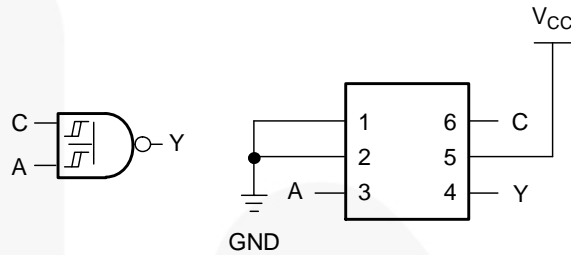
implementation is next to the board-level physical implementation of how the pins of the function should be connected.



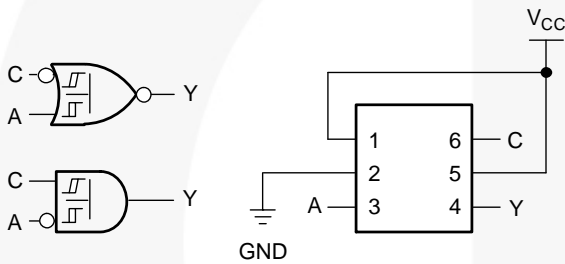
**Note:**

2. When C is L,  $Y = \overline{B}$ .
3. When C is H,  $Y = \overline{A}$ .

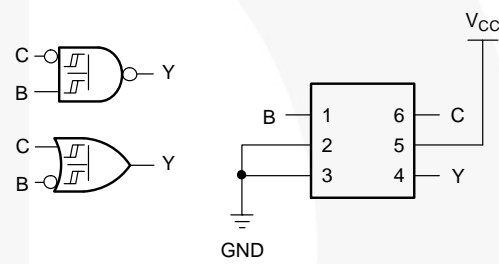
**Figure 2. 2-to-1 MUX with Inverted Output**



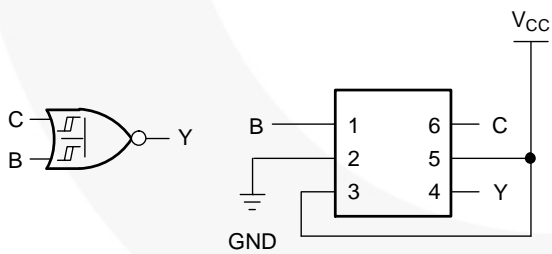
**Figure 3. 2-Input NAND Gate**



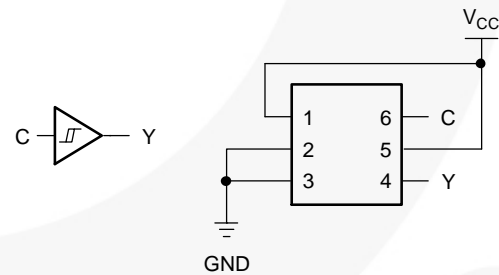
**Figure 4. Input NOR Gate with One Inverted Input  
2-Input AND Gate with One Inverted Input**



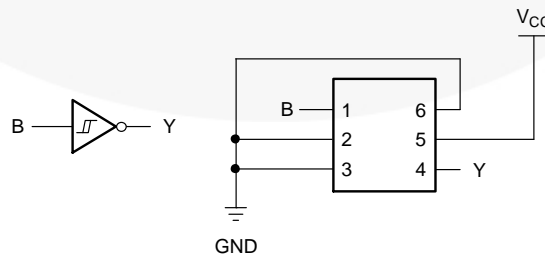
**Figure 5. 2-Input NAND Gate with One Inverted Input  
2-Input OR Gate with One Inverted Input**



**Figure 6. 2-Input NOR Gate**



**Figure 7. Buffer**



**Figure 8. Inverter**

## Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

Symbol	Parameter		Min.	Max.	Unit
V <sub>CC</sub>	Supply Voltage		-0.5	4.6	V
V <sub>IN</sub>	DC Input Voltage		-0.5	4.6	V
V <sub>OUT</sub> <sup>(2)</sup>	DC Output Voltage		-0.5	4.6	V
I <sub>IK</sub>	DC Input Diode Current	V <sub>IN</sub> < 0 V		-50	mA
I <sub>OK</sub>	DC Output Diode Current	V <sub>OUT</sub> < 0 V		-50	mA
I <sub>OL</sub>	DC Output Sink Current			+50	mA
I <sub>CC</sub> or I <sub>GND</sub>	DC V <sub>CC</sub> or Ground Current per Supply Pin			±50	mA
T <sub>STG</sub>	Storage Temperature Range		-65	+150	°C
T <sub>J</sub>	Junction Temperature Under Bias			+150	°C
T <sub>L</sub>	Junction Lead Temperature, Soldering 10s			+260	°C
P <sub>D</sub>	Power Dissipation at +85°C	MicroPak-6™		130	mW
		MicroPak2™-6		120	
ESD	Human Body Model, JEDEC:JESD22-A114			4000	V
	Charged Device Model, JEDEC:JESD22-C101			2000	

**Note:**

2. I<sub>O</sub> absolute maximum rating must be observed.

## Recommended Operating Conditions<sup>(3)</sup>

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications. Fairchild does not recommend exceeding them or designing to Absolute Maximum Ratings.

Symbol	Parameter	Condition	Min.	Max.	Unit
V <sub>CC</sub>	Supply Voltage		0.8	3.6	V
V <sub>IN</sub>	Input Voltage		0	3.6	V
V <sub>OUT</sub>	Output Voltage		0	3.6	V
I <sub>OL</sub>	Output Current	V <sub>CC</sub> =3.0 V to 3.6 V		±4.0	mA
		V <sub>CC</sub> =2.3 V to 2.7 V		±3.1	
		V <sub>CC</sub> =1.65 V to 1.95 V		±1.9	
		V <sub>CC</sub> =1.4 V to 1.6 V		±1.7	
		V <sub>CC</sub> =1.1 V to 1.3 V		±1.1	
		V <sub>CC</sub> =0.8 V		±20.0	µA
T <sub>A</sub>	Operating Temperature, Free Air		-40	+85	°C
θ <sub>JA</sub>	Thermal Resistance	MicroPak-6™		500	°C/W
		MicroPak2™-6		560	

**Note:**

3. Unused inputs must be held HIGH or LOW. They may not float.

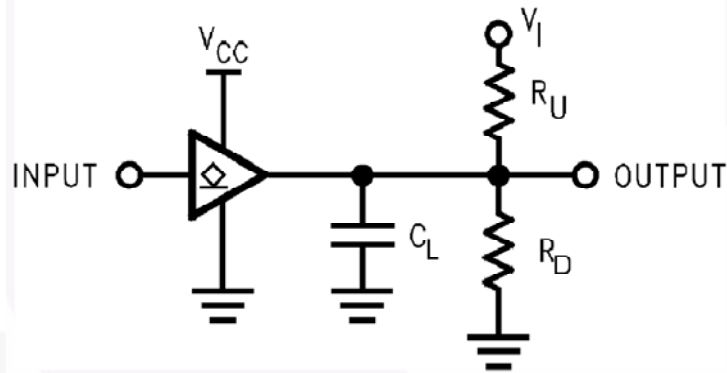
## DC Electrical Characteristics

Symbol	Parameter	V <sub>CC</sub>	Condition	T <sub>A</sub> =25°C		T <sub>A</sub> =-40 to 85°C		Unit
				Min.	Max.	Min.	Max.	
V <sub>P</sub>	Positive Threshold Voltage	0.80		0.30	0.60	0.30	0.60	V
		1.10		0.53	0.90	0.53	0.90	
		1.40		0.74	1.11	0.74	1.11	
		1.65		0.91	1.29	0.91	1.29	
		2.30		1.37	1.77	1.37	1.77	
		3.00		1.88	2.29	1.88	2.29	
V <sub>N</sub>	Negative Threshold Voltage	0.80		0.10	0.60	0.10	0.60	V
		1.10		0.26	0.65	0.26	0.65	
		1.40		0.39	0.75	0.39	0.75	
		1.65		0.47	0.84	0.47	0.84	
		2.30		0.69	1.04	0.69	1.04	
		3.00		0.88	1.24	0.88	1.24	
V <sub>H</sub>	Hysteresis Voltage	0.80		0.07	0.50	0.07	0.50	V
		1.10		0.08	0.46	0.08	0.46	
		1.40		0.18	0.56	0.18	0.56	
		1.65		0.27	0.66	0.27	0.66	
		2.30		0.53	0.92	0.53	0.92	
		3.00		0.79	1.31	0.79	1.31	
V <sub>OL</sub>	LOW Level Output Voltage	0.80 ≤ V <sub>CC</sub> ≤ 3.60	I <sub>OL</sub> =20 μA		0.10		0.10	V
		1.10 ≤ V <sub>CC</sub> ≤ 1.30	I <sub>OL</sub> =1.1 mA		0.30 x V <sub>CC</sub>		0.30 x V <sub>CC</sub>	
		1.40 ≤ V <sub>CC</sub> ≤ 1.60	I <sub>OL</sub> =1.7 mA		0.31		0.37	
		1.65 ≤ V <sub>CC</sub> ≤ 1.95	I <sub>OL</sub> =1.9 mA		0.31		0.35	
		2.30 ≤ V <sub>CC</sub> ≤ 2.70	I <sub>OL</sub> =3.1 mA		0.44		0.45	
		2.70 ≤ V <sub>CC</sub> ≤ 3.60	I <sub>OL</sub> =4.0 mA		0.44		0.45	
I <sub>IN</sub>	Input Leakage Current	0 V to 3.6 V	0 ≤ V <sub>IN</sub> ≤ 3.6 V		±0.1		±0.5	μA
I <sub>OFF</sub>	Power Off Leakage Current	0 V	0 ≤ (V <sub>IN</sub> , V <sub>O</sub> ) ≤ 3.6 V		0.2		0.6	μA
ΔI <sub>OFF</sub>	Additional Power Off Leakage Current	0 V to 0.2 V	V <sub>IN</sub> or V <sub>O</sub> =0 V to 3.6 V		0.2		0.6	μA
I <sub>CC</sub>	Quiescent Supply Current	0.8 V to 3.6 V	V <sub>IN</sub> - V <sub>CC</sub> or GND		0.5		0.9	μA
			V <sub>CC</sub> ≤ V <sub>IN</sub> ≤ 3.6 V				±0.9	
ΔI <sub>CC</sub>	Increase in I <sub>CC</sub> per Input	3.3 V	V <sub>IN</sub> =V <sub>CC</sub> -0.6 V		40.0		50.0	μA

### AC Electrical Characteristics

Symbol	Parameter	V <sub>CC</sub>	Condition	T <sub>A</sub> =25°C			T <sub>A</sub> =-40 to 85°C		Unit
				Min.	Typ.	Max.	Min.	Max.	
t <sub>PZL</sub> , t <sub>PLZ</sub>	Propagation Delay	0.80	C <sub>L</sub> =15 pF, R <sub>U</sub> =R <sub>D</sub> =5 KΩ V <sub>I</sub> = 2 x (V <sub>CC</sub> ) (See Figure 9)		30				
		1.10 ≤ V <sub>CC</sub> ≤ 1.30		1.0	10.1	18.9	1.0	19.9	
		1.40 ≤ V <sub>CC</sub> ≤ 1.60		1.0	6.6	11.4	1.0	12.2	
		1.65 ≤ V <sub>CC</sub> ≤ 1.95		1.0	6.3	8.7	1.0	9.7	
		2.30 ≤ V <sub>CC</sub> ≤ 2.70		1.0	4.7	6.9	1.0	7.5	
		3.00 ≤ V <sub>CC</sub> ≤ 3.60		1.0	4.6	6.8	1.0	7.4	
C <sub>IN</sub>	Input Capacitance	0			0.8				pF
C <sub>OUT</sub>	Output Capacitance	0			1.7				pF
C <sub>PD</sub>	Power Dissipation Capacitance	0.80	V <sub>IN</sub> =0 V or V <sub>CC</sub> , f=10 MHz		3.0				pF
		1.10 ≤ V <sub>CC</sub> ≤ 1.30			3.1				
		1.40 ≤ V <sub>CC</sub> ≤ 1.60			3.2				
		1.65 ≤ V <sub>CC</sub> ≤ 1.95			3.4				
		2.30 ≤ V <sub>CC</sub> ≤ 2.70			3.8				
		3.00 ≤ V <sub>CC</sub> ≤ 3.60			4.4				

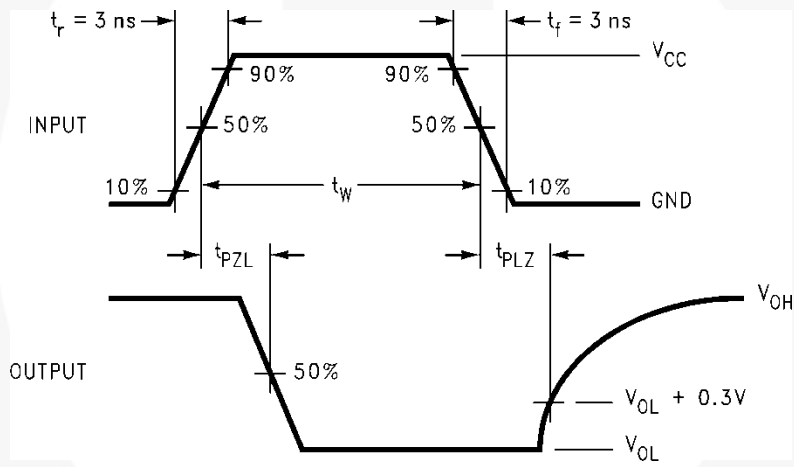
## AC Loadings and Waveforms



**Notes:**

- 4.  $C_L$  includes load and stray capacitance.
- 5. Input PRR = 1.0 MHz,  $t_w = 500$  ns.

**Figure 9. AC Test Circuit**



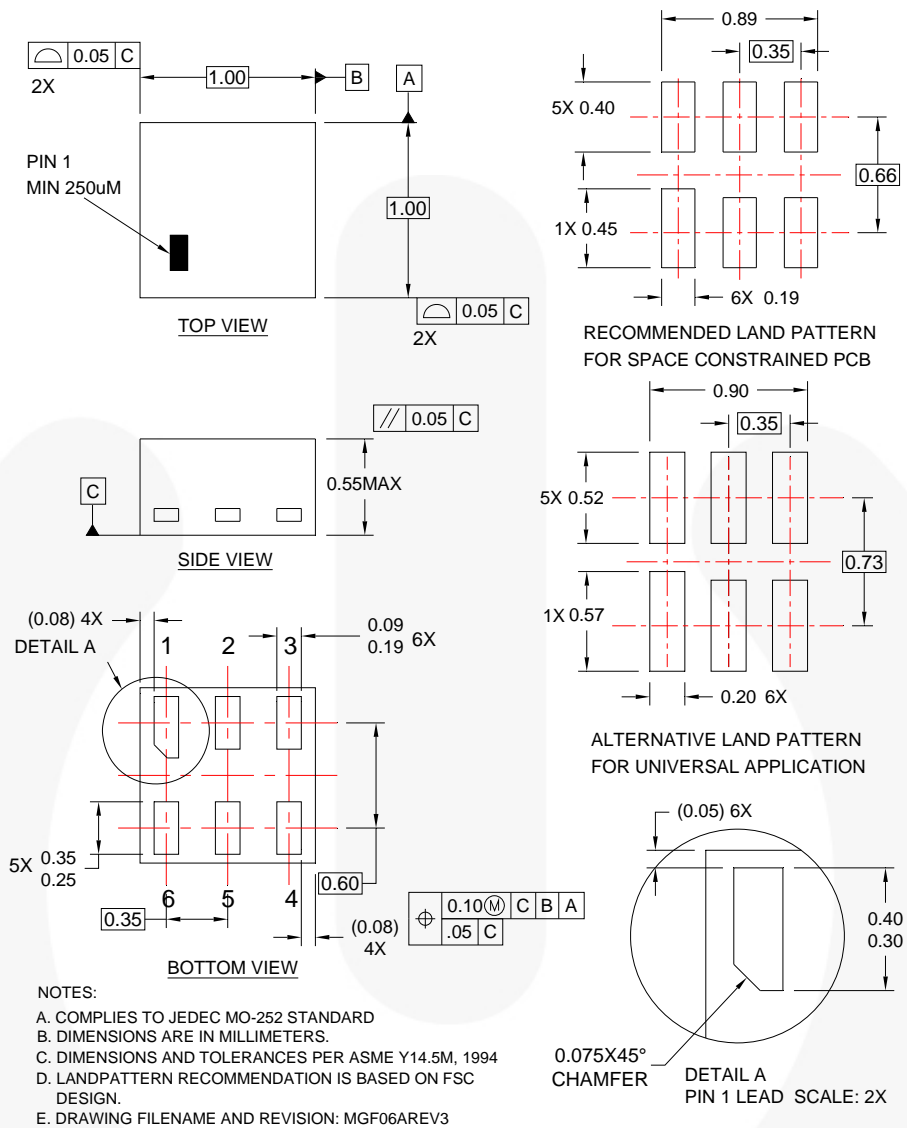
**Figure 10. AC Waveforms**

Symbol	$V_{CC}$					
	3.3 V ± 0.3 V	2.5 V ± 0.2 V	1.8 V ± 0.15 V	1.5 V ± 0.10 V	1.2 V ± 0.10 V	0.8 V
$V_{mi}$	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$
$V_{mo}$	$V_{OL} + 0.3V$	$V_{OL} + 0.15V$	$V_{OL} + 0.15V$	$V_{OL} + 0.1V$	$V_{OL} + 0.1V$	$V_{OL} + 0.1V$





## Physical Dimensions



**Figure 12. 6-Lead, MicroPak2™, 1x1 mm Body, .35 mm Pitch**

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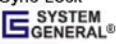
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[http://www.fairchildsemi.com/packaging/MicroPAK2\\_6L\\_tr.pdf](http://www.fairchildsemi.com/packaging/MicroPAK2_6L_tr.pdf).

Package Designator	Tape Section	Cavity Number	Cavity Status	Cover Type Status
FHX	Leader (Start End)	125 (Typical)	Empty	Sealed
	Carrier	5000	Filled	Sealed
	Trailer (Hub End)	75 (Typical)	Empty	Sealed


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CROSSVOLT™	GTO™	 ™	TinyPower™
CTL™	IntelliMAX™	Saving our world, 1mW/W/kW at a time™	TinyPWM™
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Dual Cool™	MegaBuck™	SMART START™	TriFault Detect™
EcoSPARK®	MICROCOUPLER™	Solutions for Your Success™	TRUECURRENT®*
EfficientMax™	MicroFET™	SPM®	µSerDes™
ESBC™	MicroPak™	STEALTH™	 SerDes™
 Fairchild®	MicroPak2™	SuperFET®	UHC®
Fairchild Semiconductor®	MillerDrive™	SuperSOT™-3	Ultra FRFET™
FACT Quiet Series™	MotionMax™	SuperSOT™-6	UniFET™
FACT®	mWSaver™	SuperSOT™-8	VCX™
FAST®	OptoHi™	SupreMOS®	VisualMax™
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No Identification Needed	Full Production	Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.
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