

**DESCRIPTION**

The AL4G00 quadruple 2-input positive-NAND gate is designed for 1.65V to 5.5V VCC operation.

The AL4G00 device performs the Boolean function $Y = \overline{A \cdot B}$ or $Y = \overline{A} + \overline{B}$ in positive logic. The device is fully specified for partial-power-down applications using Ioff. The Ioff circuitry disables the outputs, preventing damaging current backflow through the device when it is powered down.

The AL4G00 is operate over an ambient temperature range of -40°C to +125°C.

The AL4G00 is available in SOP14 and TSSOP14 Packages.

ORDERING INFORMATION

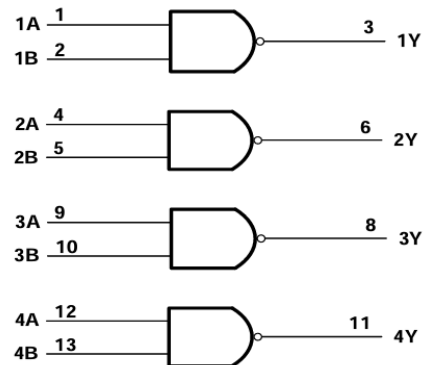
Package Type	Part Number	
SOP14 SPQ: 4,000pcs/Reel	M14	AL4G00M14R
		AL4G00M14VR
TSSOP14 SPQ:4,000pcs/Reel	TMX14	AL4G00TMX14R
		AL4G00TMX14VR
Note	V: Halogen free Package R: Tape & Reel	
AiT provides all RoHS products		

FEATURES

- Operating Voltage Range: 1.65V to 5.5V
- Low Power Consumption: 1μA (Max).
- Operating Temperature Range: -40°C to +125°C
- Inputs Accept Voltage to 5.5V
- High Output Drive: ±24mA at V_{CC}=3.0V
- Available in SOP14 and TSSOP14 Packages

APPLICATION

- Active Noise Elimination
- Bar Code Scanner
- Blood Pressure Monitor
- CPAP Machine
- Fingerprint Identification
- Network Attached Storage (NAS)

SIMPLIFIED SCHEMATIC

**PIN DESCRIPTION**

SOP14, M14				TSSOP14, TMX14			
Top View				Top View			
PIN#		Symbol	I/O	Function			
SOP14	TSSOP14						
1	1	1A	I	Channel 1 Logic Input			
2	2	1B	I	Channel 1 Logic Input			
3	3	1Y	O	Logic Level Output1			
4	4	2A	I	Channel 2 Logic Input			
5	5	2B	I	Channel 2 Logic Input			
6	6	2Y	O	Logic Level Output2			
7	7	GND	-	Ground			
8	8	3Y	O	Logic Level Output3			
9	9	3A	I	Channel 3 Logic Input			
10	10	3B	I	Channel 3 Logic Input			
11	11	4Y	O	Logic level output4			
12	12	4A	I	Channel 4 logic input			
13	13	4B	I	Channel 4 logic input			
14	14	V _{CC}	-	Power Supply			

ORDERING INFORMATION

Inputs		Output
A	B	Y
H	H	L
L	H	H
H	L	H
L	L	H

H=High Voltage Level L=Low Voltage Level



ABSOLUTE MAXIMUM RATINGS

over operating free-air temperature range (unless otherwise noted) ⁽¹⁾ ⁽²⁾

V _{CC} , Supply Voltage Range		-0.5V ~ + 6.5V
V _I , Input Voltage Range ⁽²⁾		-0.5V ~ + 6.5V
V _O , Voltage range applied to any output in the high-impedance or power-off state ⁽²⁾		-0.5V ~ + 6.5V
V _O , Voltage range applied to any output in the high or low state ⁽²⁾ ⁽³⁾		-0.5V ~ V _{CC} +0.5V
I _{IK} , Input Clamp Current	V _I < 0	-50mA
I _{OK} , Output Clamp Current	V _O < 0	-50mA
I _O , Continuous Output Current		±50mA
I _O , Continuous Current through V _{CC} or GND		±100mA
R _{θJA} , Junction-to-Ambient Thermal Resistance	SOP14	122.2°C/W
	TSSOP14	141.2°C/W
R _{θJC(top)} , Junction-to-Case(Top) Thermal Resistance	SOP14	80.9°C/W
	TSSOP14	78.8°C/W
R _{θJB} , Junction-to-Board Thermal Resistance	SOP14	80.6°C/W
	TSSOP14	85.6°C/W
Ψ _{JT} , Junction-to-Top Characterization Parameter	SOP14	40.4°C/W
	TSSOP14	27.7°C/W
Ψ _{JB} , Junction-to-Board Characterization Parameter	SOP14	80.3°C/W
	TSSOP14	85.5°C/W
R _{θJC(bot)} , Junction-to-Case(Bottom) Thermal Resistance	SOP14	-
	TSSOP14	-
T _J , Junction Temperature ⁽⁴⁾		-65°C ~ +150°C
T _{STG} , Storage Temperature		-65°C ~ +150°C

Stresses above may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated in the Electrical Characteristics are not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

- (1) The input and output negative-voltage ratings may be exceeded if the input and output current ratings are observed.
- (2) The value of V_{CC} is provided in the Recommended Operating Conditions table.
- (3) The package thermal impedance is calculated in accordance with JEDEC-51.
- (4) The maximum power dissipation is a function of T_{J(MAX)}, R_{θJA}, and T_A. The maximum allowable power dissipation at any ambient temperature is P_D = (T_{J(MAX)} - T_A) / R_{θJA}. All numbers apply for packages soldered directly onto a PCB.

ESD RATINGS

Parameter	Symbol	Min	Unit
Human-Body Model (HBM)	V _(ESD) Electrostatic Discharge	±8000	V
Machine Model (MM)		±500	



RECOMMENDED OPERATING CONFITIONS

over recommended operating free-air temperature range (TYP values are at $T_A = +25^{\circ}\text{C}$, Full= $-40^{\circ}\text{C} \sim 125^{\circ}\text{C}$, unless otherwise noted.)

Parameter	Symbol	Conditions	Min	Typ.	Max	Unit
Supply Voltage	V_{CC}	Operating	1.65	-	5.50	
		Data retention only	1.50	-	5.50	
High-Level Input Voltage	V_{IH}	$V_{CC} = 1.65\text{ V} \sim 1.95\text{ V}$	$0.65 \times V_{CC}$	-	-	V
		$V_{CC} = 2.3\text{ V} \sim 2.7\text{ V}$	1.70	-	-	
		$V_{CC} = 3\text{ V} \sim 3.6\text{ V}$	2.20	-	-	
		$V_{CC} = 4.5\text{ V} \sim 5.5\text{ V}$	$0.70 \times V_{CC}$	-	-	
Low-Level Input Voltage	V_{IL}	$V_{CC} = 1.65\text{ V} \sim 1.95\text{ V}$	-	-	$0.15 \times V_{CC}$	V
		$V_{CC} = 2.3\text{ V} \sim 2.7\text{ V}$	-	-	0.30	
		$V_{CC} = 3\text{ V} \sim 3.6\text{ V}$	-	-	0.40	
		$V_{CC} = 4.5\text{ V} \sim 5.5\text{ V}$	-	-	$0.15 \times V_{CC}$	
Input Voltage	V_I	-	0	-	5.50	V
Output Voltage	V_O	-	0	-	V_{CC}	V
Input Transition Rise or Fall	$\Delta t / \Delta v$	$V_{CC} = 1.8\text{ V} \pm 0.15\text{ V}, 2.5\text{ V} \pm 0.2\text{ V}$	-	-	20	ns/V
		$V_{CC} = 3.30\text{ V} \pm 0.3\text{ V}$	-	-	10	
		$V_{CC} = 5\text{ V} \pm 0.5\text{ V}$	-	-	5	
Operating Temperature	T_A	-	-40	-	+125	$^{\circ}\text{C}$

* All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation.



DC CHARACTERISTICS

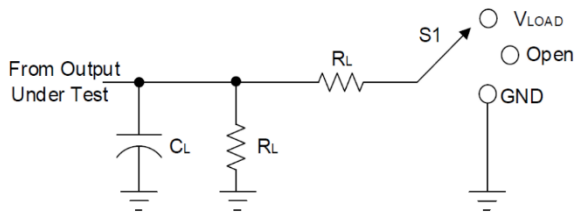
Parameter		Conditions		Min	Typ.	Max	Unit
V_{OH}		$I_{OH} = -100\ \mu A$, $V_{CC}=1.65\sim 5.5V$	$-40^{\circ}C \sim +125^{\circ}C$	$V_{CC}\sim 0.10$	-	-	V
		$I_{OH} = -4mA$, $V_{CC}=1.65V$		1.20	-	-	
		$I_{OH} = -8mA$, $V_{CC}=2.3V$		1.90	-	-	
		$I_{OH} = -16mA$, $V_{CC}=3V$		2.40	-	-	
		$I_{OH} = -24mA$, $V_{CC}=3V$		2.30	-	-	
		$I_{OH} = -32mA$, $V_{CC}=4.5V$		3.80	-	-	
V_{OL}		$I_{OL} = -100\ \mu A$, $V_{CC}=1.65\sim 5.5V$	$-40^{\circ}C \sim +125^{\circ}C$	-	-	0.10	V
		$I_{OL} = -4mA$, $V_{CC}=1.65V$		-	-	0.45	
		$I_{OL} = -8mA$, $V_{CC}=2.3V$		-	-	0.30	
		$I_{OL} = -16mA$, $V_{CC}=3V$		-	-	0.40	
		$I_{OL} = -24mA$, $V_{CC}=3V$		-	-	0.55	
		$I_{OL} = -32mA$, $V_{CC}=4.5V$		-	-	0.55	
I_i	All Inputs	$V_i = 5.5V$ or GND, $V_{CC}=0V\sim 5.5V$	$+25^{\circ}C$		± 0.1	± 1	μA
			$-40^{\circ}C \sim +125^{\circ}C$		-	± 5	
I_{off}		V_i or $V_o = 5.5V$, $V_{CC}=0V$	$+25^{\circ}C$	-	± 0.1	± 1	μA
			$-40^{\circ}C \sim +125^{\circ}C$	-	-	± 10	
I_{CC}		$V_i = 5.5V$ or GND, $I_o=0$, $V_{CC}=1.65V\sim 5.5V$	$+25^{\circ}C$	-	0.1	4	μA
			$-40^{\circ}C \sim +125^{\circ}C$	-	-	10	
ΔI_{CC}		One input at $V_{CC}-0.6V$, Other inputs at V_{CC} or GND, $V_{CC}=3V\sim 5.5V$	$-40^{\circ}C \sim +125^{\circ}C$	-	-	500	μA

AC CHARACTERISTICS

Parameter	Symbol	Conditions		Min	Typ.	Max	Unit
Propagation Delay	t_{pd}	$V_{CC}=1.8V\pm 0.15V$	$C_L=30pF$, $R_L=1K\Omega$	-	21	-	ns
		$V_{CC}=2.5V\pm 0.2V$	$C_L=30pF$, $R_L=500\Omega$	-	7.8	-	
		$V_{CC}=3.3V\pm 0.3V$	$C_L=50pF$, $R_L=500\Omega$	-	5.7	-	
		$V_{CC}=5V\pm 0.5V$	$C_L=50pF$, $R_L=500\Omega$	-	4.2	-	
Input Capacitance	C_i	$V_i = V_{CC}$ or GND, $V_{CC}=3.3V$	$+25^{\circ}C$	-	4	-	pF
Power Dissipation Capacitance	C_{pd}	$V_{CC}=1.8V$	$f=10MHz$	-	21	-	pF
		$V_{CC}=2.5V$		-	22	-	
		$V_{CC}=3.3V$		-	22	-	
		$V_{CC}=5V$		-	25	-	

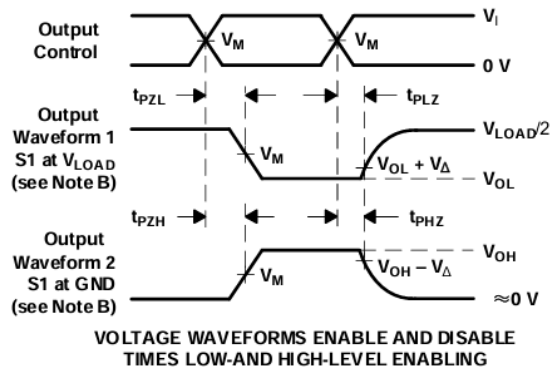
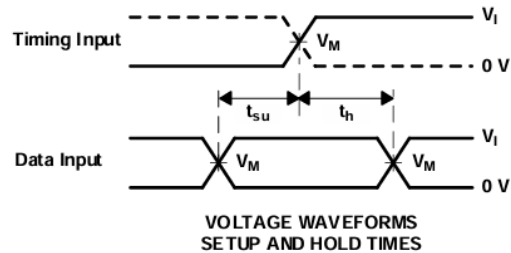
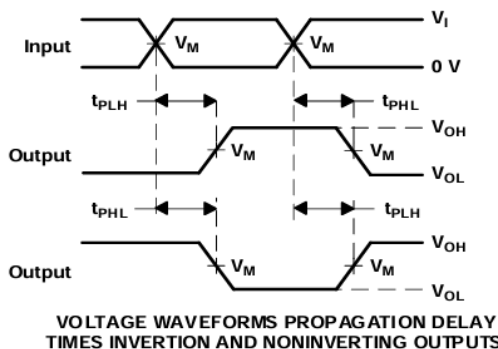
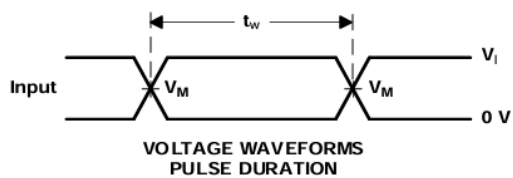


PARAMETER MEASUREMENT INFORMATION



TEST	S1
t_{PLH}/t_{PHL}	V_{LOAD}
t_{PLZ}/t_{PZL}	V_{LOAD}
t_{PHZ}/t_{PZH}	V_{LOAD}

VCC	INPUTS		VM	VLOAD	CL		RL		VΔ
	VI	tr/tf							
1.8V±0.15V	VCC	≤2ns	VCC/2	2 x VCC	15pF	30pF	1MΩ	1kΩ	0.15V
2.5V±0.2V	VCC	≤2ns	VCC/2	2 x VCC	15pF	30pF	1MΩ	500Ω	0.15V
3.3V±0.3V	3V	≤2.5ns	1.5V	6V	15pF	50pF	1MΩ	500Ω	0.3V
5V±0.5V	VCC	≤2.5ns	VCC/2	2 x VCC	15pF	50pF	1MΩ	500Ω	0.3V

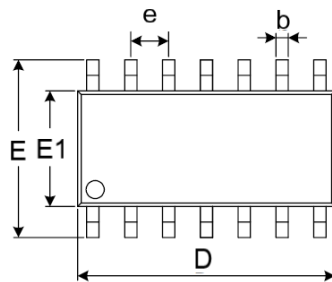


- (A) C_L includes probe and jig capacitance.
- (B) Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.
- (C) All input pulses are supplied by generators having the following characteristics: $PRR \leq 10 \text{ MHz}$, $Z_o = 50 \Omega$.
- (D) The outputs are measured one at a time, with one transition per measurement.
- (E) t_{PLZ} and t_{PHZ} are the same as t_{dis} .
- (F) t_{LPZ} and t_{LPZ} are the same as t_{en} .
- (G) t_{PLH} and t_{PHL} are the same as t_{pd} .
- (H) All parameters and waveforms are not applicable to all devices.

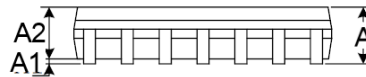


PACKAGE INFORMATION

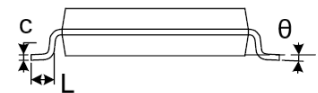
Dimension in SOP14 (Unit: mm)



TOP VIEW

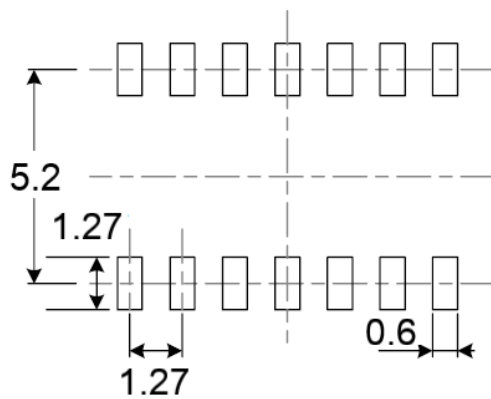


BOTTOM VIEW



SIDE VIEW

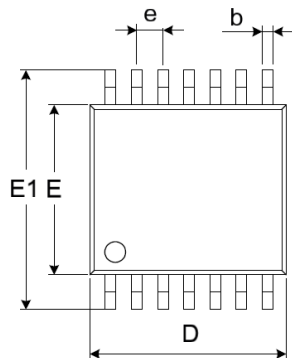
Recommended Land Pattern



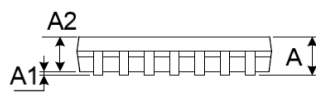
Symbol	Millimeters	
	Min	Max
A	1.350	1.750
A1	0.100	0.250
A2	1.350	1.550
b	0.330	0.510
c	0.170	0.250
D	4.800	5.000
e	1.270 BSC	
E	5.800	6.200
E1	3.800	4.000
L	0.400	1.270
θ	0°	8°



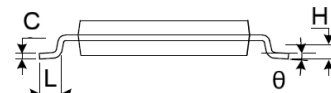
Dimension in TSSOP14 (Unit: mm)



TOP VIEW

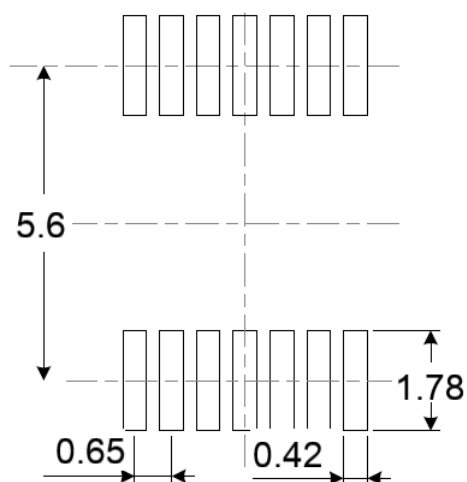


BOTTOM VIEW



SIDE VIEW

Recommended Land Pattern



Symbol	Millimeters	
	Min	Max
A	-	1.200
A1	0.500	0.150
A2	0.800	1.050
b	0.190	0.300
c	0.090	0.200
D	4.860	5.100
E	4.300	4.500
E1	6.250	6.550
e	0.650 BSC	
L	0.500	0.700
H	0.25 TYP	
θ	1°	7°



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