M74ALS20AP

DUAL 4-INPUT POSITIVE NAND GATE

T-43-15

DESCRIPTION

The M74ALS20AP is a semiconductor integrated circuit consisting of two 4-input positive-logic NAND gates, usable as negative-logic NOR gates.

FEATURES

- High speed (t_{pd} = 5ns typical: C_L = 15pF)
- Low power dissipation (P_d = 2.6mW typical)
- Low output impedance
- Wide operating temperature range (T_a = −20 ~ +75°C)

APPLICATION

General purpose, for use in industrial and consumer digital equipment.

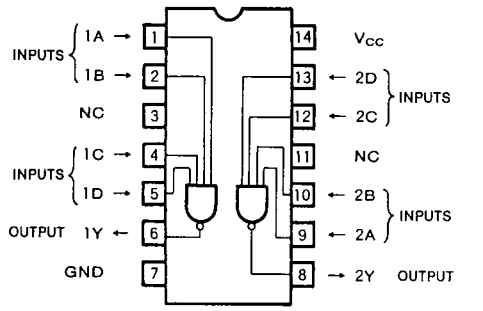
FUNCTIONAL DESCRIPTION

Employing PNP transistors in the inputs and active pull-up in the outputs, the M74ALS20AP achieves high speed, low power dissipation, and high fan-out. Utilization of a clamp diode in the inputs and outputs reduces ringing and undershooting.

When A, B, C, and D inputs are simultaneously high-level, output Y is low-level, and when at least one of the inputs is low, the output is high.

The buffer version of M74ALS20AP, the M74ALS40AP and the M74ALS1020AP (I_{OL} = 24mA), is also available.

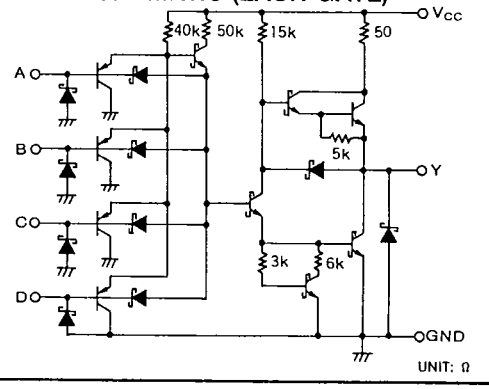
PIN CONFIGURATION (TOP VIEW)



NC: NO CONNECTION

Outline 14P4

CIRCUIT SCHEMATIC (EACH GATE)



FUNCTION TABLE

Inputs		Output
A	N	Y
L	L	H
H	L	H
L	H	H
H	H	L

N=B · C · D

ABSOLUTE MAXIMUM RATINGS (T_a = −20 ~ +75°C, unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit
V_{CC}	Supply voltage		−0.5~+7	V
V_I	Input voltage		−0.5~+7	V
V_O	Output voltage	High-level state	−0.5~V_{CC}	V
T_{opr}	Operating free-air ambient temperature range		−20~+75	°C
T_{stg}	Storage temperature range		−65~+150	°C

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Limits			Unit
		Min	Typ	Max	
V_{CC}	Supply voltage	4.5	5	5.5	V
V_{IH}	High-level input voltage	2			V
V_{IL}	Low-level input voltage			0.8	V
I_{OH}	High-level output current	0		−0.4	mA
I_{OL}	Low-level output current	0		8	mA
T_{opr}	Operating free-air ambient temperature range	−20		+75	°C

ELECTRICAL CHARACTERISTICS (T_a = −20 ~ +75°C, unless otherwise noted)

Symbol	Parameter	Test conditions		Limits			Unit
				Min	Typ*	Max	
V_{IC}	Input clamp voltage	V_{CC}=4.5V, I_{IC}=−18mA				−1.2	V
V_{OH}	High-level output voltage	V_{CC}=4.5~5.5V, I_{OH}=−0.4mA		V_{CC}−2			V
V_{OL}	Low-level output voltage	V_{CC}=4.5V	I_{OL}=4mA		0.25	0.4	V
			I_{OL}=8mA		0.35	0.5	
I_I	Input current at maximum voltage	V_{CC}=5.5V, V_I=7V				0.1	mA
I_{IH}	High-level input current	V_{CC}=5.5V, V_I=2.7V				20	μA
I_{IL}	Low-level input current	V_{CC}=5.5V, V_I=0.4V				−0.1	mA
I_O	Output current	V_{CC}=5.5V, V_O=2.25V		−30		−112	mA
I_{CCH}	Supply current, all outputs high	V_{CC}=5.5V, V_I=0V			0.22	0.4	mA
I_{CCL}	Supply current, all outputs low	V_{CC}=5.5V, V_I=4.5V			0.81	1.5	mA

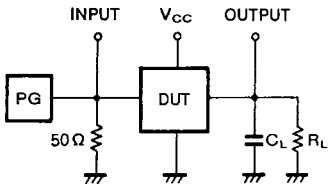
* : All typical values are at V_{CC} = 5V, T_a = 25°C.

SWITCHING CHARACTERISTICS

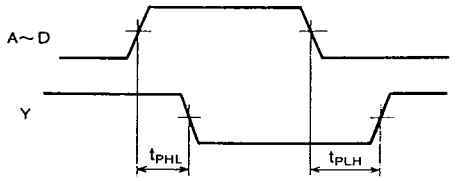
Symbol	Parameter			Test conditions/Limits (Note 1)							Unit
				V_{CC}=5V, C_L=15pF, R_L=500Ω	V_{CC}=4.5~5.5V, C_L=50pF, R_L=500Ω						
				T_a=25°C	T_a=0~70°C			T_a=−20~+75°C			
		Inputs	Output	Typ	Min	Typ*	Max	Min	Typ*	Max	
t_{PLH}	Propagation time	A, B	Y	5	3	6	11	3	6	12	ns
t_{PHL}		C, D		5	3	7	10	3	7	11	

* : All typical values are at V_{CC} = 5V, T_a = 25°C.

Note 1: Measurement circuit



TIMING DIAGRAM (Reference level = 1.3V)



(1) The pulse generator (PG) has the following characteristics:

PRR≦1MHz

t_r=2ns, t_f=2ns

V_{IH}=3.5V, V_{IL}=0.3V

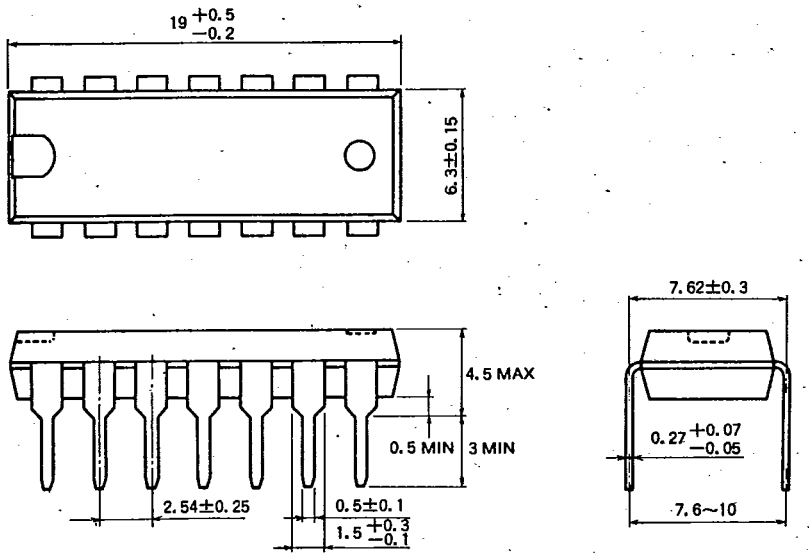
duty cycle=50%

Z_O=50Ω

(2) C_L includes probe and jig capacitance.

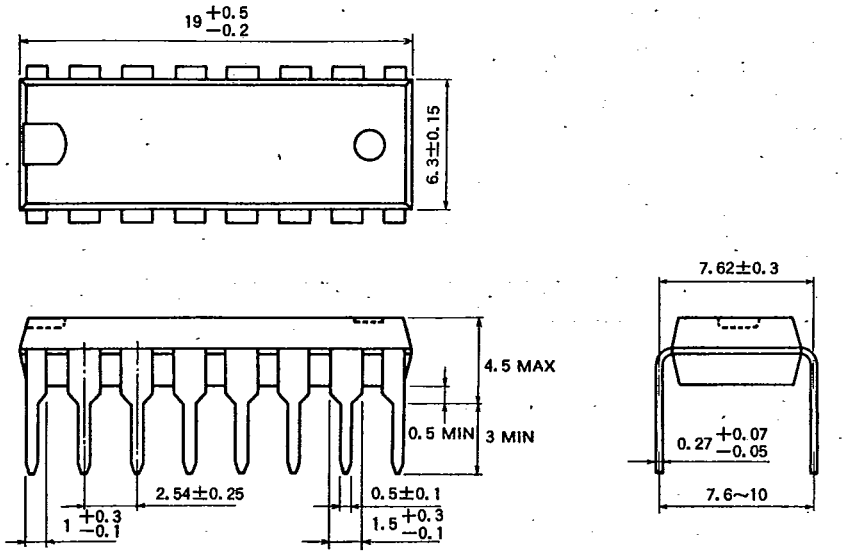
TYPE 14P4 14-PIN MOLDED PLASTIC DIP

Dimension in mm



TYPE 16P4 16-PIN MOLDED PLASTIC DIP

Dimension in mm

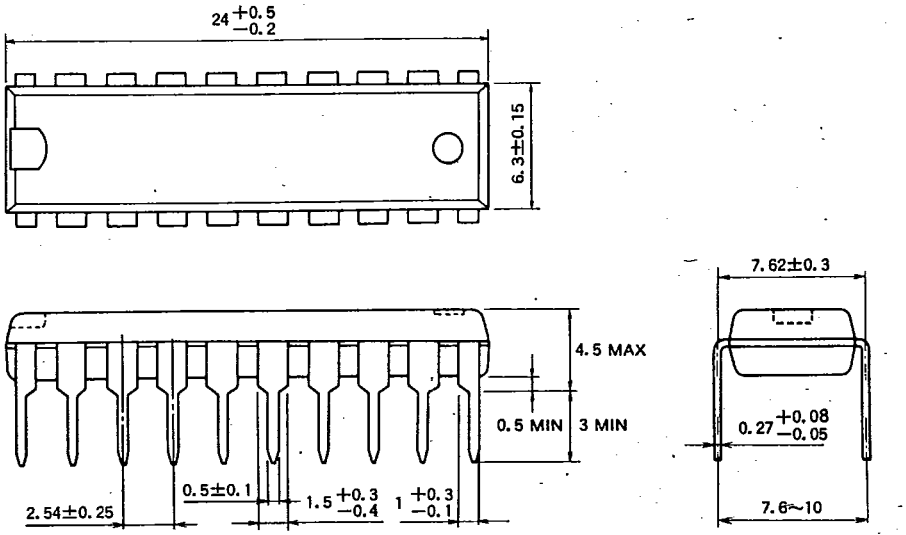


PACKAGE OUTLINES

6249827 MITSUBISHI (DGTL LOGIC)
91D 12324 D T-90-20

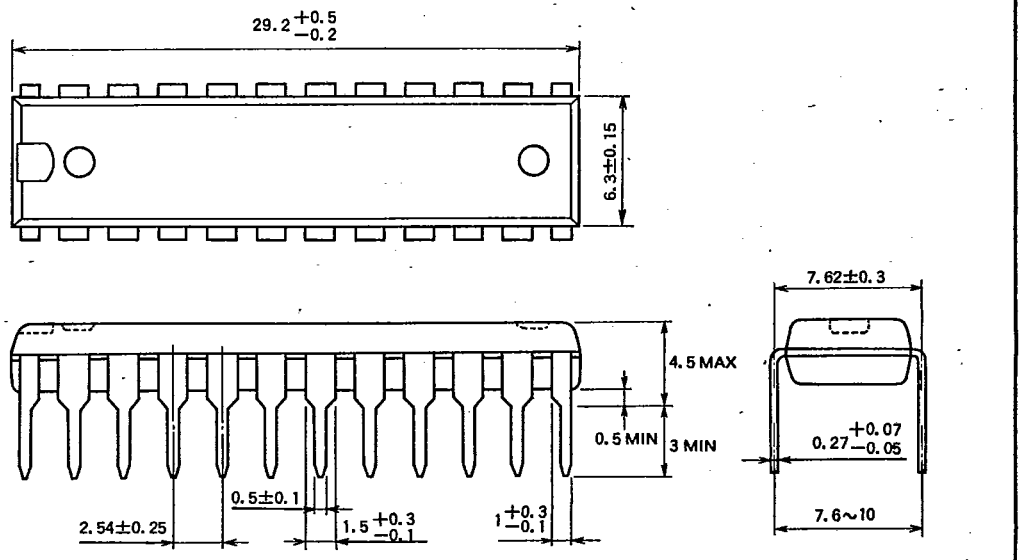
TYPE 20P4 20-PIN MOLDED PLASTIC DIP

Dimension in mm



TYPE 24P4D 24-PIN MOLDED PLASTIC DIP

Dimension in mm



TYPE DESIGNATION TABLE

ALSTTL SERIES SOP TYPE DESIGNATION TABLE

Type		Circuit function	Package Outlines
M74ALS00ADP	★	Quadruple 2-Input Positive NAND Gate	14P2P
M74ALS02DP	★	Quadruple 2-Input Positive NOR Gate	14P2P
M74ALS04ADP	★	Hex Inverter	14P2P
M74ALS05ADP	★★	Hex Inverter with Open Colletor Output	14P2P
M74ALS08DP	★	Quadruple 2-Input Positive AND Gate	14P2P
M74ALS09DP	★★	Quadruple 2-Input Positive AND Gate with Open Collector Output	14P2P
M74ALS10ADP	★	Triple 3-Input Positive NAND Gate	14P2P
M74ALS11ADP	★	Triple 3-Input Positive AND Gate	14P2P
M74ALS20ADP	★★	Dual 4-Input Positive NAND Gate	14P2P
M74ALS27DP	★★	Triple 3-Input Positive NOR Gate	14P2P
M74ALS30ADP	★★	Single 8-Input Positive NAND Gate	14P2P
M74ALS32DP	★	Quadruple 2-Input Positive OR Gate	14P2P
M74ALS37ADP	★★	Quadruple 2-Input Positive NAND Buffer	14P2P
M74ALS38ADP	★★	Quadruple 2-Input Positive NAND Buffer with Open Collector Output	14P2P
M74ALS74ADP	★	Dual D-Type Positive Edge-Triggered Flip-Flop with Set and Reset	14P2P
M74ALS109ADP	★★	Dual J-$\overline{K}$ Positive Edge-Triggered Flip-Flop with Set and Reset	16P2P
M74ALS112ADP	★	Dual J-K Negative Edge-Triggered Flip-Flop with Set and Reset	16P2P
M74ALS131DP	★★	3-Line to 8-Line Decoder/Demultiplexer with Address Register	16P2P
M74ALS138DP	★	3-Line to 8-Line Decoder/Demultiplexer	16P2P
M74ALS153DP	★★	Dual 4-Line to 1-Line Data Selector/Multiplexer with Strobe	16P2P
M74ALS157DP	★	Quadruple 2-Line to 1-Line Data Selector/Multiplexer	16P2P
M74ALS161BDP	★★	Synchronous Presettable 4-Bit Binary Counter with Direct Reset	16P2P
M74ALS163BDP	★★	Fully Synchronous Presettable 4-Bit Binary Counter	16P2P
M74ALS169BDP	★★	Synchronous 4-Bit Binary Counter	16P2P
M74ALS174DP	★	Hex D-Type Positive Edge-Triggered Flip-Flop with Reset	16P2P
M74ALS175DP	★★	Quadruple D-Type Positive Edge-Triggered Flip-Flop with Reset	16P2P
M74ALS193DP	★★	Synchronous Presettable Up/Down 4-Bit Binary Counter	16P2P
M74ALS240ADWP	★	Octal Buffer/Line Driver with 3-State Output (Inverted)	20P2V
M74ALS244ADWP	★	Octal Buffer/Line Driver with 3-State Output (Noninverted)	20P2V
M74ALS245ADWP	★★	Octal Bus Transceiver with 3-State Output (Noninverted)	20P2V
M74ALS245A-1DWP	★★	Octal Bus Transceiver with 3-State Output (Noninverted)	20P2V
M74ALS257DP	★	Quadruple 2-Line to 1-Line Data Selector/Multiplexer with 3-State Output	16P2P
M74ALS273DWP	★★	Octal D-Type Positive Edge-Triggered Flip-Flop with Reset	20P2V
M74ALS299DWP	★★	8-Bit Universal Shift/Storage Register with 3-State Output	20P2V
M74ALS373DWP	★★	Octal D-Type Transparent Latch with 3-State Output	20P2V
M74ALS374DWP	★★	Octal D-Type Positive Edge-Triggered Flip-Flop with 3-State Output	20P2V
M74ALS533DWP	★★	Octal D-Type Transparent Latch with 3-State Output (Inverted)	20P2V
M74ALS534DWP	★★	Octal D-Type Positive Edge-Triggered Flip-Flop with 3-State Output (Inverted)	20P2V
M74ALS561ADWP	★★	Synchronous Presettable 4-Bit Binary Counter with 3-State Output	20P2V
M74ALS569ADWP	★★	Synchronous Up/Down 4-Bit Binary Counter with 3-State Output	20P2V
M74ALS573ADWP	★★	Octal D-Type Transparent Latch with 3-State Output (Noninverted)	20P2V
M74ALS574ADWP	★★	Octal D-Type Positive Edge-Triggered Flip-Flop with 3-State Output (Noninverted)	20P2V
M74ALS640ADWP	★★	Octal Bus Transceiver with 3-State Output (Inverted)	20P2V
M74ALS642ADWP	★★	Octal Bus Transceiver with Open Collector Output (Inverted)	20P2V
M74ALS645ADWP	★★	Octal Bus Transceiver with 3-State Output (Noninverted)	20P2V
M74ALS1034DP	★★	Hex Noninverting Buffer	14P2P

★: New product ★★ : Under development

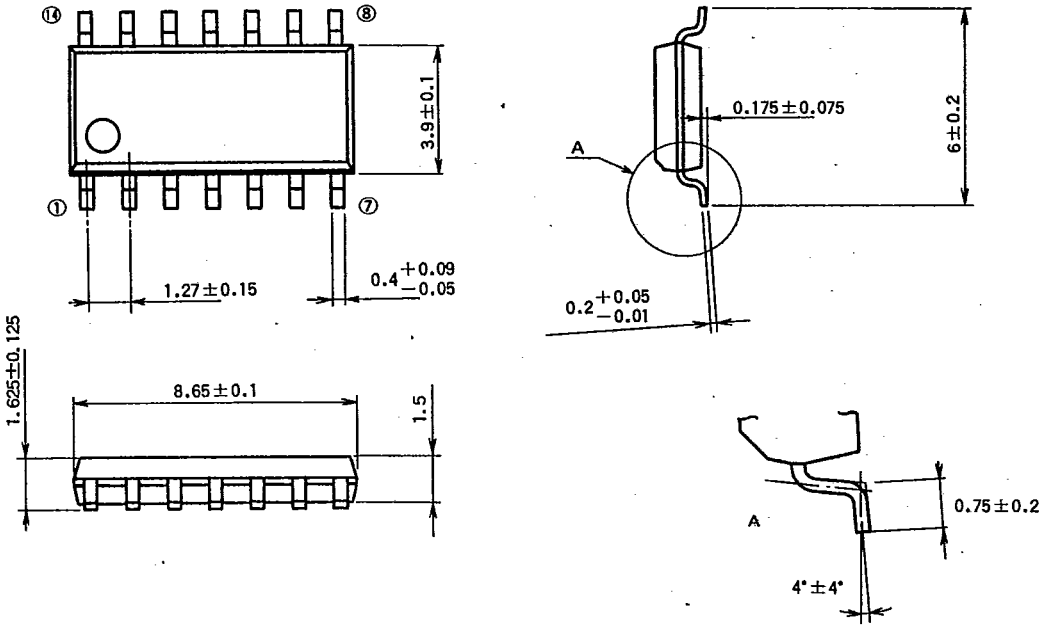
DESCRIPTION

The ALSTTL SOP (Small Outline Package) devices are identical in all respects except for their package outlines to DIP (Dual Inline Package).

MITSUBISHI (DGTL LOGIC) 91D D 6249827 0012786 0 MIT3
T-90-20

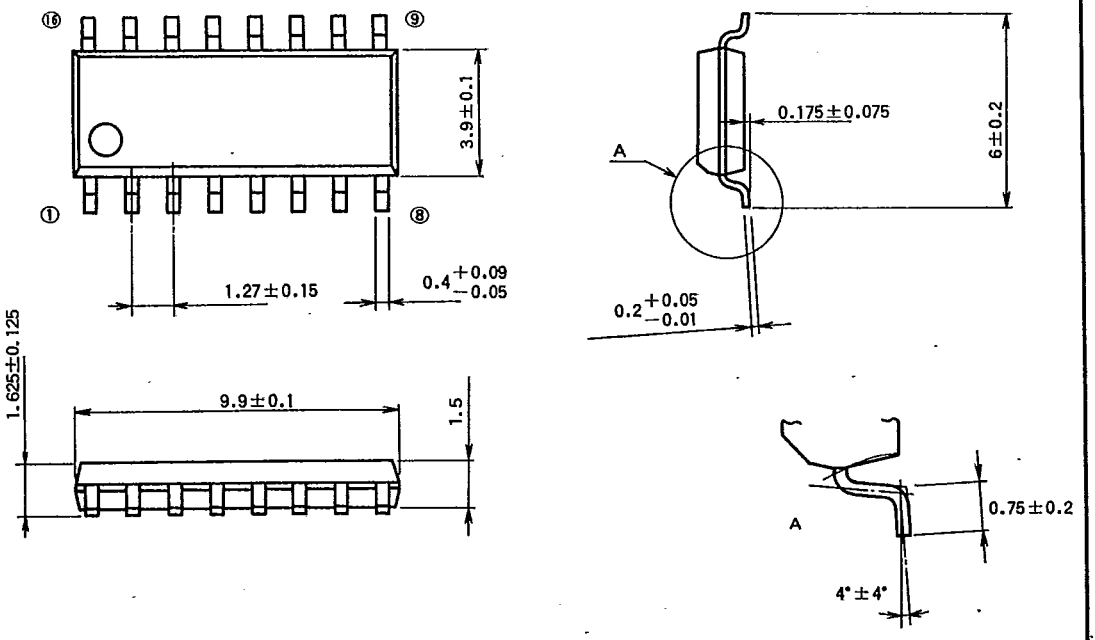
TYPE 14P2P 14-PIN MOLDED PLASTIC SOP (JEDEC 150mil body)

Dimension in mm



TYPE 16P2P 16-PIN MOLDED PLASTIC SOP (JEDEC 150mil body)

Dimension in mm



PACKAGE OUTLINES

TYPE 20P2V 20-PIN MOLDED PLASTIC SOP (JEDEC 300mil body)

Dimension in mm