HD74AC381/HD74ACT381 • 4-Bit Arithmetic Logic Unit

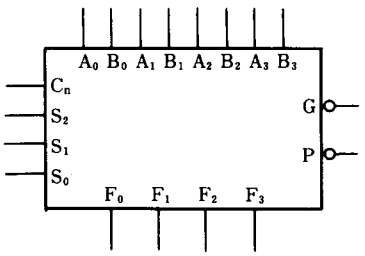
Preliminary

Description

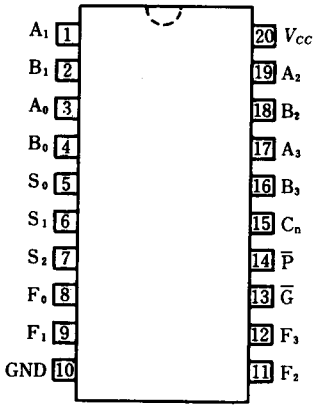
The HD74AC381/HD74ACT381 performs three arithmetic and three logic operations on two 4-bit words, A and B. Two additional select input codes force the function outputs Low or High. Carry propagate and generate outputs are provided for use with the HD74AC182/HD74ACT182 carry look-ahead generator for high-speed expansion to longer word lengths. For ripple expansion, refer to the HD74AC382/HD74ACT382 ALU data sheet.

- Outputs Source/Sink 24 mA
- HD74ACT381 has TTL-Compatible Inputs

Logic Symbol



Pin Assignment



(Top View)

Pin Names

A_0—A_3	A Operand Inputs
B_0—B_3	B Operand Inputs
S_0—S_2	Function Select Inputs
C_n	Carry Input
$\overline{G}$	Carry Generate Output (Active Low)
$\overline{P}$	Carry Propagate Output (Active Low)
F_0—F_3	Function Outputs

Functional Description

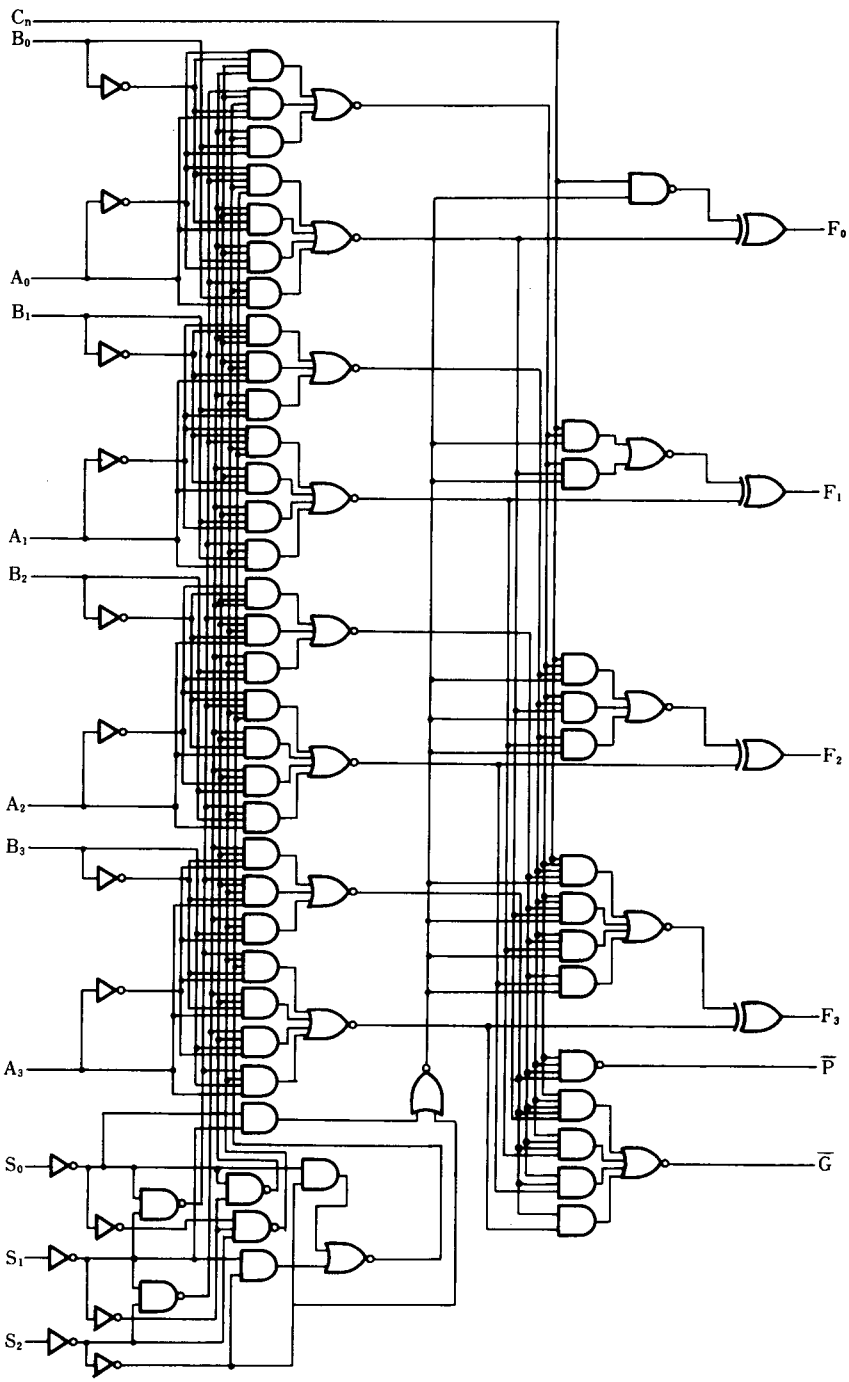
Signals applied to the Select inputs S_0—S_2 determine the mode of operation, as indicated in the Function Select Table. An extensive listing of input and output levels is shown in the Truth Table. The circuit performs the arithmetic functions for either active High or active Low operands, with output levels in the same convention. In the Subtract operating modes, it is necessary to force a carry (High for active High operands, Low for active Low operands) into the C_n input of the least significant package.

Function Select Table

Select			Operation
S_0	S_1	S_2	
L	L	L	Clear
H	L	L	B Minus A
L	H	L	A Minus B
H	H	L	A Plus B
L	L	H	A⊕B
H	L	H	A+B
L	H	H	AB
H	H	H	Preset

H = High Voltage Level
L = Low Voltage Level

Logic Diagram



Please note that this diagram is provided only for the understanding of logic operations and should not be used to estimate propagation delays.

DC Characteristics (unless otherwise specified)

Symbol	Parameter	Max	Unit	Condition
I_{CC}	Maximum Quiescent Supply Current	80	μA	$V_{IN}=V_{CC}$ or Ground, $V_{CC}=5.5V$, Ta=Worst Case
I_{CC}	Maximum Quiescent Supply Current	8.0	μA	$V_{IN}=V_{CC}$ or Ground, $V_{CC}=5.5V$, Ta=25°C
I_{CCT}	Maximum I_{CC}/Input (HD74ACT381)	1.5	mA	$V_{IN}=V_{CC}-2.1V$, $V_{CC}=5.5V$, Ta=Worst Case

AC Characteristics: HD74AC381

Symbol	Parameter	V_{CC}* (V)	Ta=+25°C C_L=50pF			Ta=−40°C to +85°C C_L=50pF		Unit
			Min	Typ	Max	Min	Max	
t_{PLH}	Propagation Delay Cn to Fi	3.3	1.0	13.5	16.5	1.0	18.0	ns
		5.0	1.0	10.5	13.0	1.0	14.0	
t_{PHL}	Propagation Delay Cn to Fi	3.3	1.0	12.5	15.5	1.0	17.0	ns
		5.0	1.0	9.5	12.0	1.0	13.0	
t_{PLH}	Propagation Delay Any A or B to Any F	3.3	1.0	21.0	25.0	1.0	28.0	ns
		5.0	1.0	17.0	20.0	1.0	22.0	
t_{PHL}	Propagation Delay Any A or B to Any F	3.3	1.0	20.5	24.5	1.0	27.5	ns
		5.0	1.0	16.5	19.5	1.0	21.5	
t_{PLH}	Propagation Delay Si to Fi	3.3	1.0	23.0	27.5	1.0	31.0	ns
		5.0	1.0	19.0	22.0	1.0	24.0	
t_{PHL}	Propagation Delay Si to Fi	3.3	1.0	22.5	27.0	1.0	30.5	ns
		5.0	1.0	18.5	21.5	1.0	23.5	
t_{PLH}	Propagation Delay Ai or Bi to $\overline{G}$	3.3	1.0	18.5	22.5	1.0	25.0	ns
		5.0	1.0	15.0	17.5	1.0	19.0	
t_{PHL}	Propagation Delay Ai or Bi to $\overline{G}$	3.3	1.0	18.0	22.0	1.0	24.5	ns
		5.0	1.0	14.5	17.0	1.0	18.5	
t_{PLH}	Propagation Delay Ai or Bi to $\overline{P}$	3.3	1.0	18.5	22.5	1.0	25.0	ns
		5.0	1.0	15.0	17.5	1.0	19.0	
t_{PHL}	Propagation Delay Ai or Bi to $\overline{P}$	3.3	1.0	18.0	22.0	1.0	24.5	ns
		5.0	1.0	14.5	17.0	1.0	18.5	
t_{PLH}	Propagation Delay Si to $\overline{G}$ or $\overline{P}$	3.3	1.0	21.0	25.0	1.0	28.0	ns
		5.0	1.0	17.0	20.0	1.0	22.0	
t_{PHL}	Propagation Delay Si to $\overline{G}$ or $\overline{P}$	3.3	1.0	20.5	24.5	1.0	27.5	ns
		5.0	1.0	16.5	19.5	1.0	21.5	

*Voltage Range 3.3 is 3.3V±0.3V
Voltage Range 5.0 is 5.0V±0.5V

AC Characteristics: HD74ACT381

Symbol	Parameter	V_{CC}* (V)	Ta = +25°C C_L = 50pF			Ta = −40°C to +85°C C_L = 50pF		Unit
			Min	Typ	Max	Min	Max	
t_{PLH}	Propagation Delay Cn to Fi	5.0	1.0	12.5	15.0	1.0	16.0	ns
t_{PHL}	Propagation Delay Cn to Fi	5.0	1.0	12.0	14.5	1.0	15.5	ns
t_{PLH}	Propagation Delay Any A or B to Any F	5.0	1.0	19.5	22.5	1.0	25.0	ns
t_{PHL}	Propagation Delay Any A or B to Any F	5.0	1.0	19.0	22.0	1.0	24.5	ns
t_{PLH}	Propagation Delay Si to Fi	5.0	1.0	20.5	24.5	1.0	27.5	ns
t_{PHL}	Propagation Delay Si to Fi	5.0	1.0	20.0	24.0	1.0	27.0	ns
t_{PLH}	Propagation Delay Ai or Bi to $\overline{G}$	5.0	1.0	17.5	20.5	1.0	23.0	ns
t_{PHL}	Propagation Delay Ai or Bi to $\overline{G}$	5.0	1.0	17.0	20.0	1.0	22.5	ns
t_{PLH}	Propagation Delay Ai or Bi to $\overline{P}$	5.0	1.0	17.5	20.5	1.0	23.0	ns
t_{PHL}	Propagation Delay Ai or Bi to $\overline{P}$	5.0	1.0	17.0	20.0	1.0	22.5	ns
t_{PLH}	Propagation Delay Si to $\overline{G}$ or $\overline{P}$	5.0	1.0	18.0	21.0	1.0	23.5	ns
t_{PHL}	Propagation Delay Si to $\overline{G}$ or $\overline{P}$	5.0	1.0	17.5	20.5	1.0	23.0	ns

*Voltage Range 5.0 is 5.0V ±0.5V

Capacitance

Symbol	Parameter	Typ	Unit	Condition
C_{IN}	Input Capacitance	4.5	pF	V_{CC} = 5.5V
C_{PD}	Power Dissipation Capacitance	65	pF	V_{CC} = 5.0V

Package Information

In the HD74AC series of Advanced CMOS logic, either plastic DIP and small outline packages can be selected.
To order, please refer to the following package code.

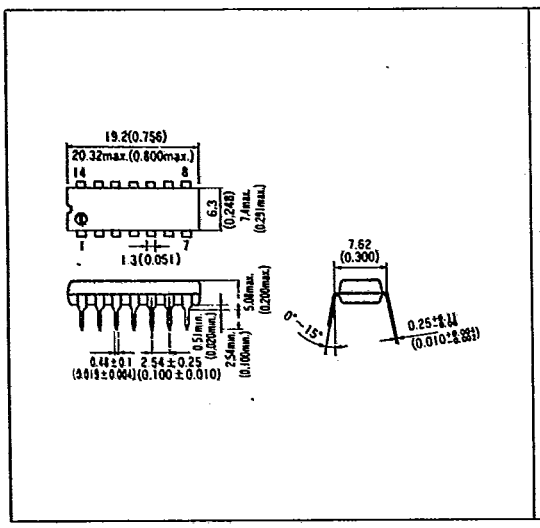
• Package code of Advanced CMOS Logic

HD74AC XXXX P

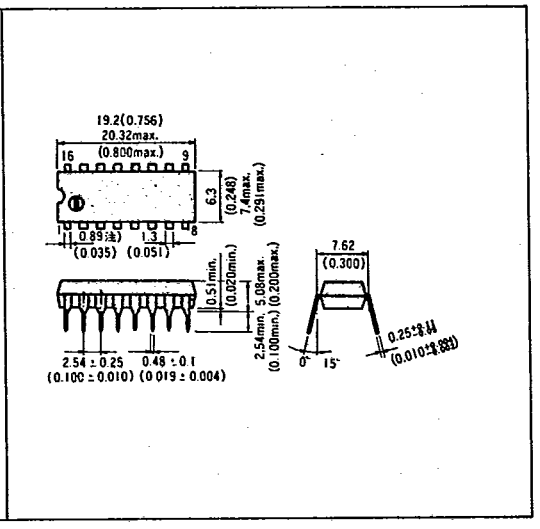
- Package code
  - P: Plastic DIP,
  - FP: Small outline package
- Individual device code
- 74AC: Commercial FACT
- 74ACT: Commercial TTL-Compatible Advanced CMOS
- Initial cad of Hitachi digital IC

Plastic DIP Package [Unit: mm (inch)]

14 Pin type



16 Pin type



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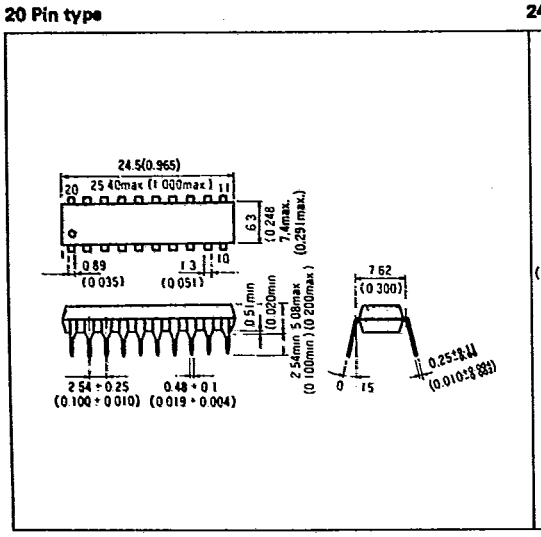
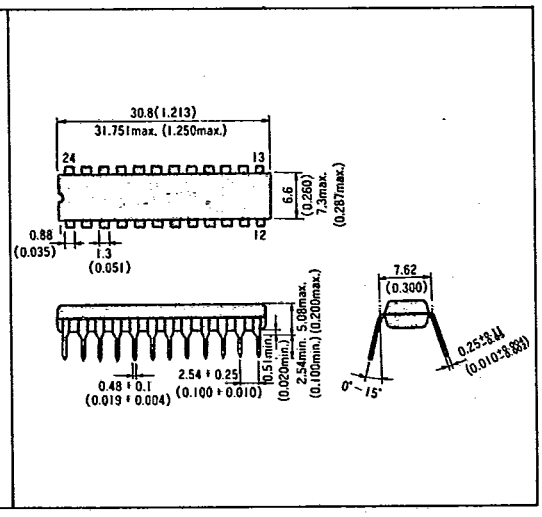


24 Pin type



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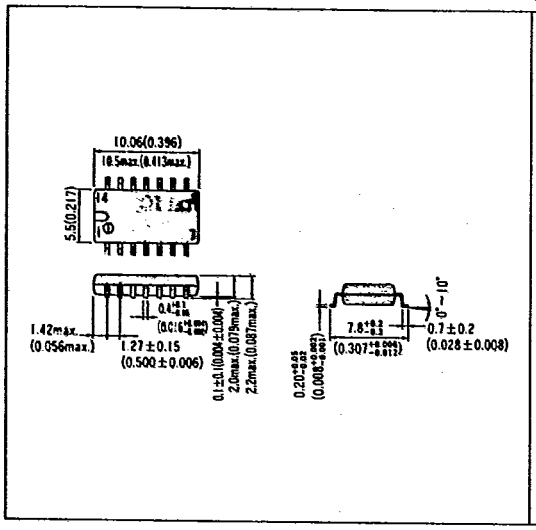
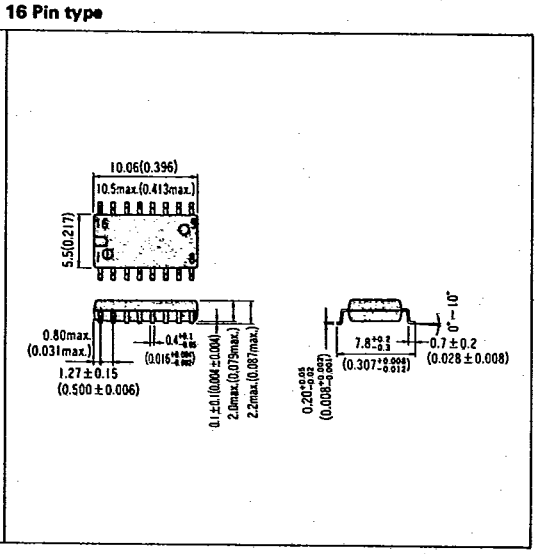
Package Information

Small Outline Package [Unit: mm (inch)]

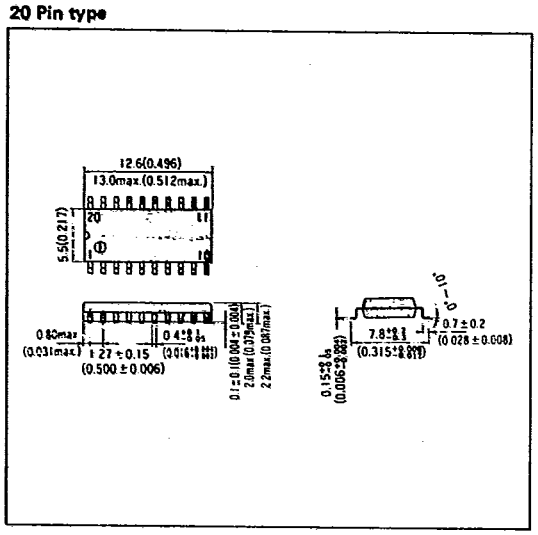
14 Pin type



16 Pin type



20 Pin type



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