TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

TC74AC283P, TC74AC283F, TC74AC283FN

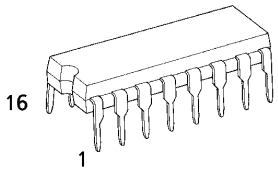
4 – BIT BINARY FULL ADDER

(Note) The JEDEC SOP (FN) is not available in Japan.

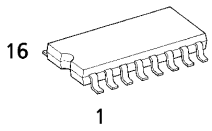
The TC74AC283 is an advanced high speed CMOS 4 - BIT BINARY FULL ADDER fabricated with silicon gate and double - layer metal wiring C^2MOS technology.
It achieves the high speed operation similar to equivalent Bipolar Schottky TTL while maintaining the CMOS low power dissipation.
Sum (Σ) outputs are provided for each bit and a resultant carry (C4) is obtained from the fourth bit.
This adder features full internal look - ahead across all four bits.
A4 × n bit binary adder is easily built up by cascading the AC283 without any additional logic.
All inputs are equipped with protection circuits against static discharge or transient excess voltage.

FEATURES :

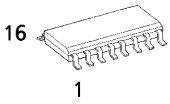
- High Speed····· t_{pd} = 7.0ns(typ.) at V_{CC} = 5V
- Low Power Dissipation····· I_{CC} = 8μA(Max.) at Ta = 25°C
- High Noise Immunity····· $V_{NIH} = V_{NIL}$ = 28% V_{CC} (Min.)
- Symmetrical Output Impedance··· $|I_{OH}| = I_{OL}$ = 24mA (Min.)
  Capability of driving 50Ω transmission lines.
- Balanced Propagation Delays····· $t_{pLH} \simeq t_{pHL}$
- Wide Operating Voltage Range···· V_{CC} (opr) = 2V ~ 5.5V
- Pin and Function Compatible with 74F283



P (DIP16-P-300-2.54A)
Weight : 1.00g (Typ.)

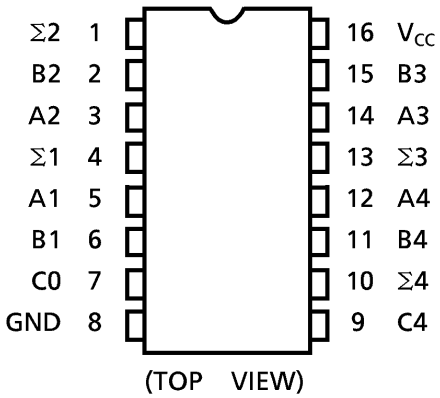


F (SOP16-P-300-1.27)
Weight : 0.18g (Typ.)



FN (SOL16-P-150-1.27)
Weight : 0.13g (Typ.)

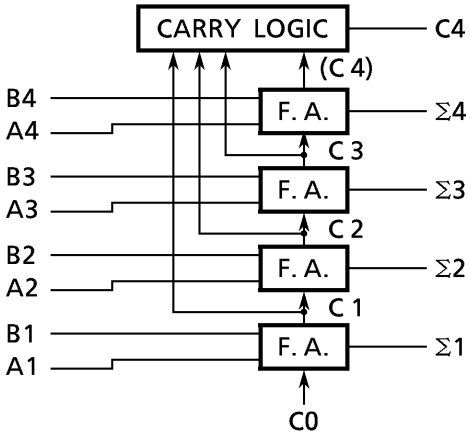
PIN ASSIGNMENT



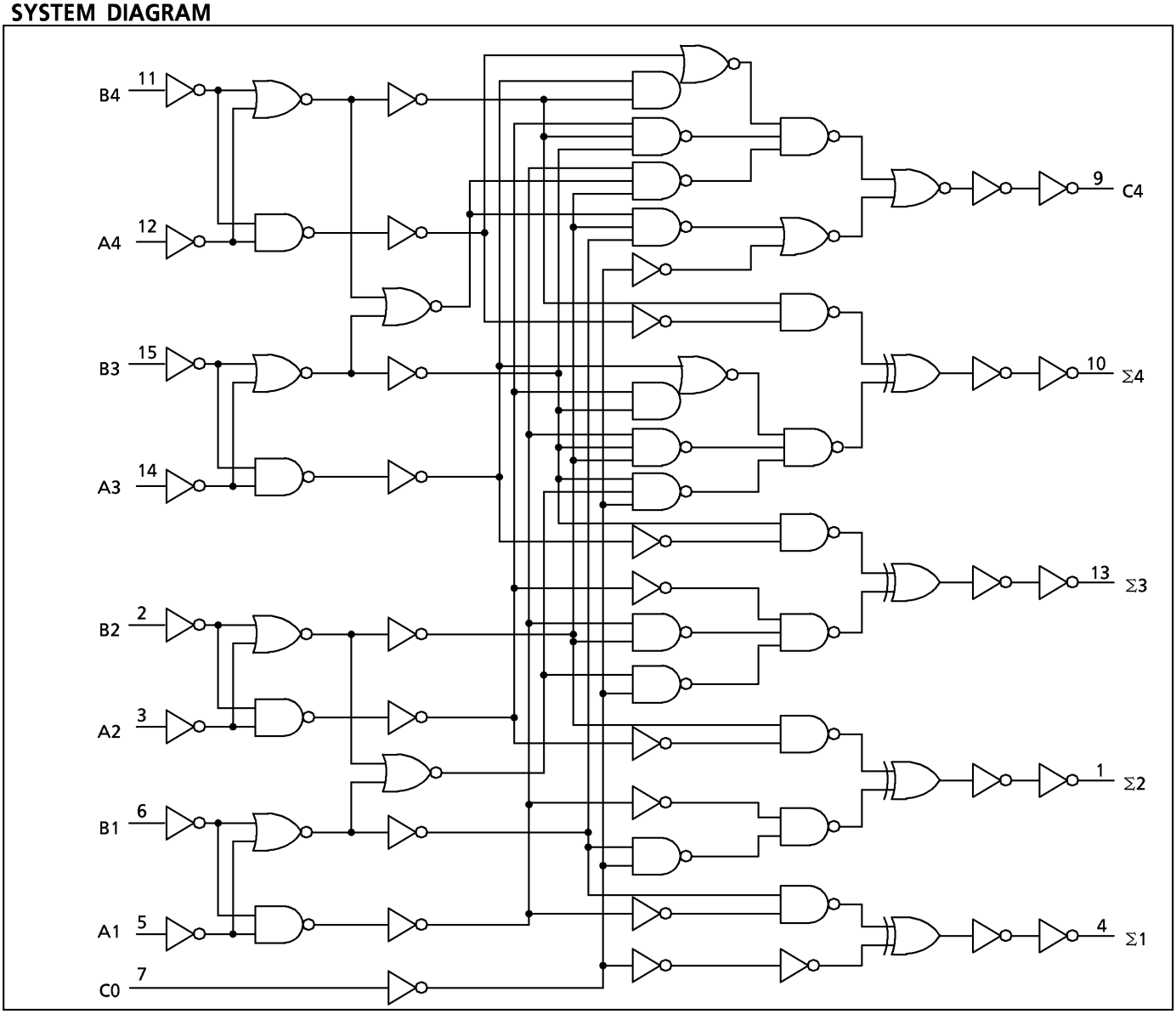
TRUTH TABLE (1bit)

INPUTS			OUTPUTS	
Bn	An	Cn − 1	Σn	Cn
L	L	L	L	L
L	L	H	H	L
L	H	L	H	L
L	H	H	L	H
H	L	L	H	L
H	L	H	L	H
H	H	L	L	H
H	H	H	H	H

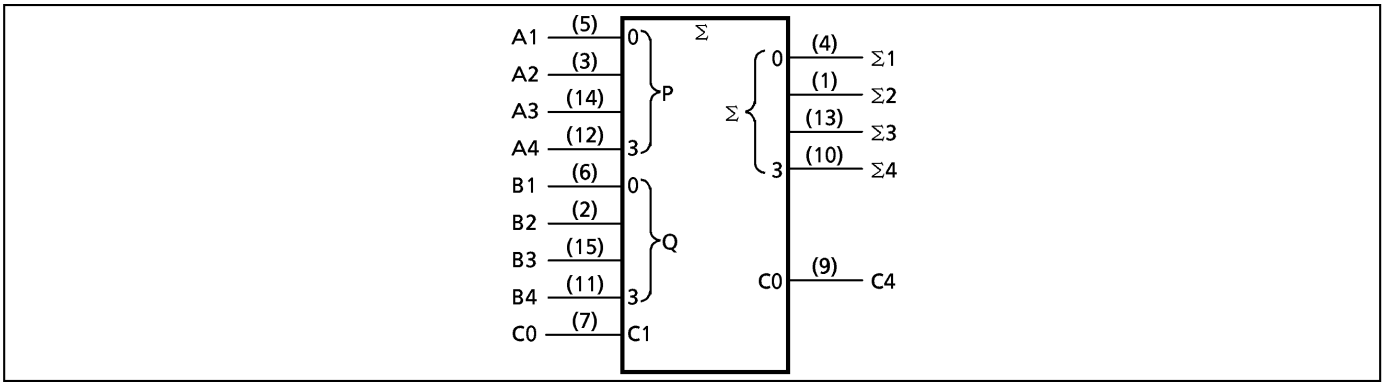
BLOCK DIAGRAM



SYSTEM DIAGRAM



IEC LOGIC SYMBOL



ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage Range	V_{CC}	−0.5~7.0	V
DC Input Voltage	V_{IN}	−0.5~V_{CC} + 0.5	V
DC Output Voltage	V_{OUT}	−0.5~V_{CC} + 0.5	V
Input Diode Current	I_{IK}	± 20	mA
Output Diode Current	I_{OK}	± 50	mA
DC Output Current	I_{OUT}	± 50	mA
DC V_{CC}/Ground Current	I_{CC}	± 125	mA
Power Dissipation	P_D	500 (DIP)* / 180 (SOP)	mW
Storage Temperature	T_{stg}	−65~150	°C

*500mW in the range of Ta = −40°C~65°C. From Ta = 65°C to 85°C a derating factor of −10mW/°C should be applied up to 300mW.

RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage	V_{CC}	2.0~5.5	V
Input Voltage	V_{IN}	0~V_{CC}	V
Output Voltage	V_{OUT}	0~V_{CC}	V
Operating Temperature	T_{opr}	−40~85	°C
Input Rise and Fall Time	dt / dV	0~ 100 (Vcc = 3.3 ± 0.3V) 0~ 20 (Vcc = 5 ± 0.5V)	ns / V

DC ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITION		V_{CC} (V)	Ta = 25°C MIN.	Ta = 25°C TYP.	Ta = 25°C MAX.	Ta = −40~85°C MIN.	Ta = −40~85°C MAX.	UNIT
High - Level Input Voltage	V_{IH}			2.0 3.0 5.5	1.50 2.10 3.85	— — —	— — —	1.50 2.10 3.85	— — —	V
Low - Level Input Voltage	V_{IL}			2.0 3.0 5.5	— — —	— — —	0.50 0.90 1.65	— — —	0.50 0.90 1.65	V
High - Level Output Voltage	V_{OH}	V_{IN} = V_{IH} or V_{IL}	I_{OH} = −50μA	2.0 3.0 4.5	1.9 2.9 4.4	2.0 3.0 4.5	— — —	1.9 2.9 4.4	— — —	V
			I_{OH} = −4mA I_{OH} = −24mA I_{OH} = −75mA*	3.0 4.5 5.5	2.58 3.94 —	— — —	— — —	2.48 3.80 3.85	— — —	
Low - Level Output Voltage	V_{OL}	V_{IN} = V_{IH} or V_{IL}	I_{OL} = 50μA	2.0 3.0 4.5	— — —	0.0 0.0 0.0	0.1 0.1 0.1	— — —	0.1 0.1 0.1	V
			I_{OL} = 12mA I_{OL} = 24mA I_{OL} = 75mA*	3.0 4.5 5.5	— — —	— — —	0.36 0.36 —	— — —	0.44 0.44 1.65	
Input Leakage Current	I_{IN}	V_{IN} = V_{CC} or GND		5.5	—	—	± 0.1	—	± 1.0	μA
Quiescent Supply Current	I_{CC}	V_{IN} = V_{CC} or GND		5.5	—	—	8.0	—	80.0	

* : This spec indicates the capability of driving 50Ω transmission lines.
One output should be tested at a time for a 10ms maximum duration.

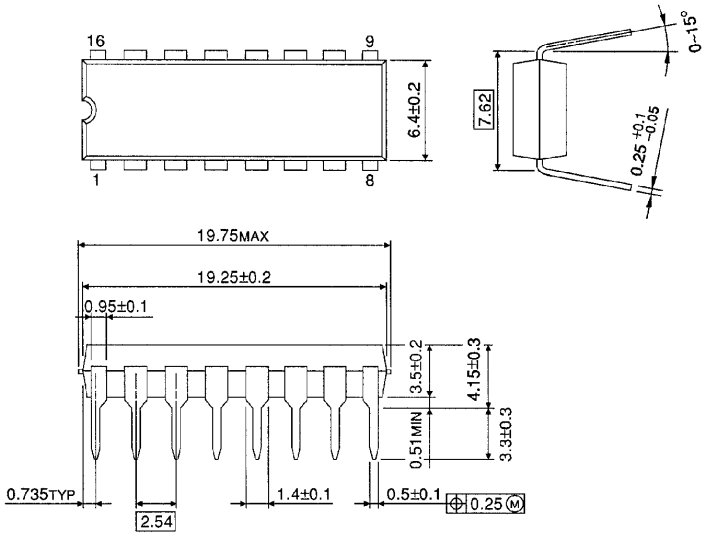
AC ELECTRICAL CHARACTERISTICS (C_L = 50pF, R_L = 500Ω, Input $t_r = t_f$ = 3ns)

PARAMETER	SYMBOL	TEST CONDITION	Ta = 25°C			Ta = −40~85°C		UNIT
		V_{CC} (V)	MIN.	TYP.	MAX.	MIN.	MAX.	
Propagation Delay Time (C0−Σn)	t_{pLH} t_{pHL}	3.3 ± 0.3 5.0 ± 0.5	− −	10.6 7.1	17.5 10.6	1.0 1.0	20.0 12.1	ns
Propagation Delay Time (C0−C4)	t_{pLH} t_{pHL}	3.3 ± 0.3 5.0 ± 0.5	− −	9.4 6.5	15.5 9.6	1.0 1.0	17.7 11.0	
Propagation Delay Time (An, Bn−Σn)	t_{pLH} t_{pHL}	3.3 ± 0.3 5.0 ± 0.5	− −	12.1 7.7	20.2 12.0	1.0 1.0	23.0 13.6	
Propagation Delay Time (An, Bn−C4)	t_{pLH} t_{pHL}	3.3 ± 0.3 5.0 ± 0.5	− −	11.6 7.5	19.3 11.4	1.0 1.0	22.0 13.0	
Input Capacitance	C_{IN}		−	5	10	−	10	pF
Power Dissipation Capacitance	C_{PD} (1)		−	125	−	−	−	

Note (1) C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.
Average operating current can be obtained by the equation:

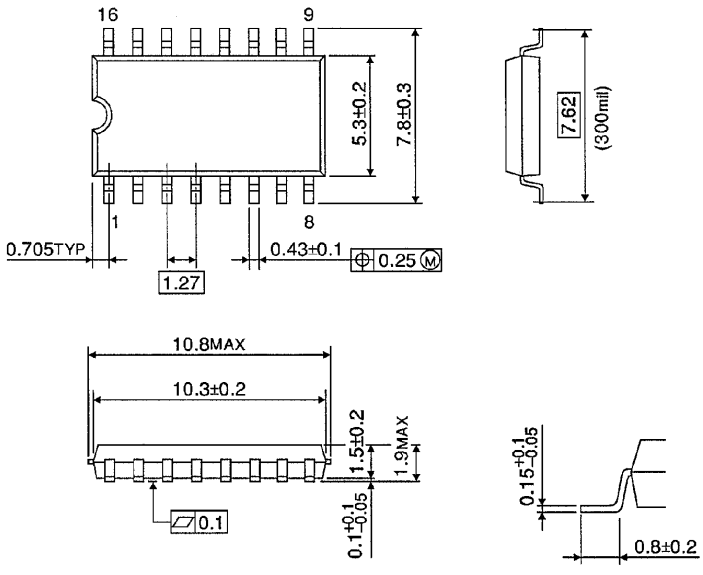
$$I_{CC}(opr) = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}$$

DIP 16PIN PACKAGE DIMENSIONS (DIP16-P-300-2.54A) Unit in mm



Weight : 1.00g (Typ.)

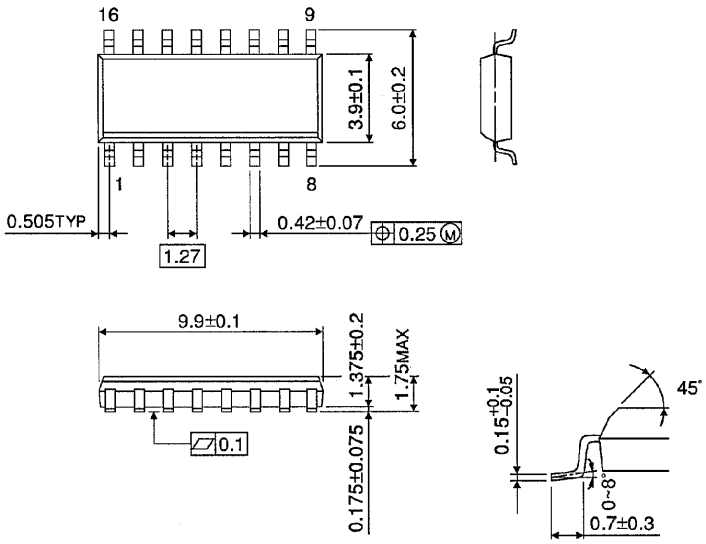
SOP 16PIN (200mil BODY) PACKAGE DIMENSIONS (SOP16-P-300-1.27) Unit in mm



Weight : 0.18g (Typ.)

SOP 16PIN (150mil BODY) PACKAGE DIMENSIONS (SOL16-P-150 -1.27) Unit in mm

(Note) This package is not available in Japan.



Weight : 0.13g (Typ.)

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