

TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

TC74AC521P, TC74AC521F

8-Bit Equality Comparator

The TC74AC521 is an advanced high speed CMOS 8-BIT DIGITAL COMPARATOR fabricated with silicon gate and double-layer metal wiring C²MOS technology.

It achieves the high speed operation similar to equivalent Bipolar Schottky TTL while maintaining the CMOS low power dissipation.

It compares two 8-bit binary or BCD words applied inputs P₀ thru P₇, and inputs Q₀ thru Q₇, and indicates whether or not they are equal.

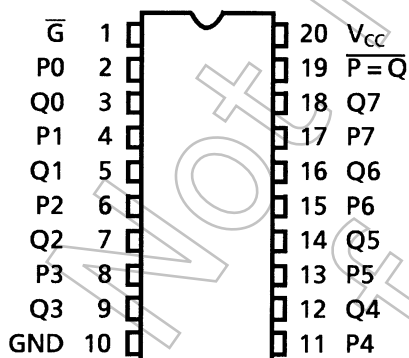
A signal active low enable is provided to facilitate cascading of several packages to compare words greater than 8 bits.

All inputs are equipped with protection circuits against static discharge or transient excess voltage.

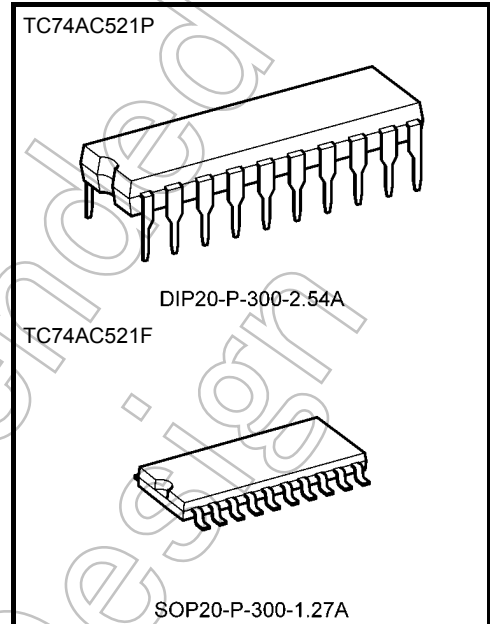
Features

- High speed: $t_{pd} = 6.4 \text{ ns (typ.)}$ at $V_{CC} = 5 \text{ V}$
- Low power dissipation: $I_{CC} = 8 \mu\text{A (max)}$ at $T_a = 25^\circ\text{C}$
- High noise immunity: $V_{NIH} = V_{NIL} = 28\% V_{CC} \text{ (min)}$
- Symmetrical output impedance: $|I_{OH}| = I_{OL} = 24 \text{ mA (min)}$
Capability of driving 50Ω transmission lines.
- Balanced propagation delays: $t_{pLH} \approx t_{pHL}$
- Wide operating voltage range: $V_{CC} \text{ (opr)} = 2 \text{ to } 5.5 \text{ V}$
- Pin and function compatible with 74F521

Pin Assignment



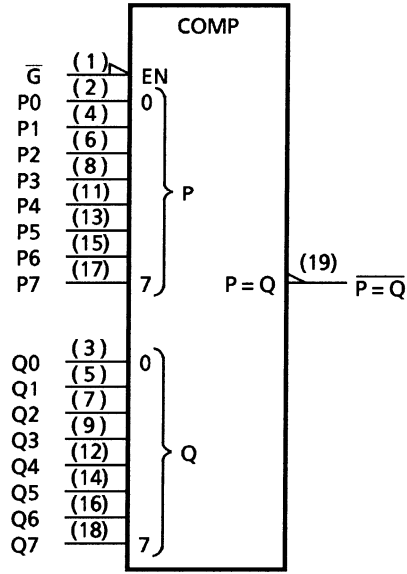
(TOP VIEW)



Weight	
DIP20-P-300-2.54A	: 1.30 g (typ.)
SOP20-P-300-1.27A	: 0.22 g (typ.)

Start of commercial production
1989-11

IEC Logic Symbol

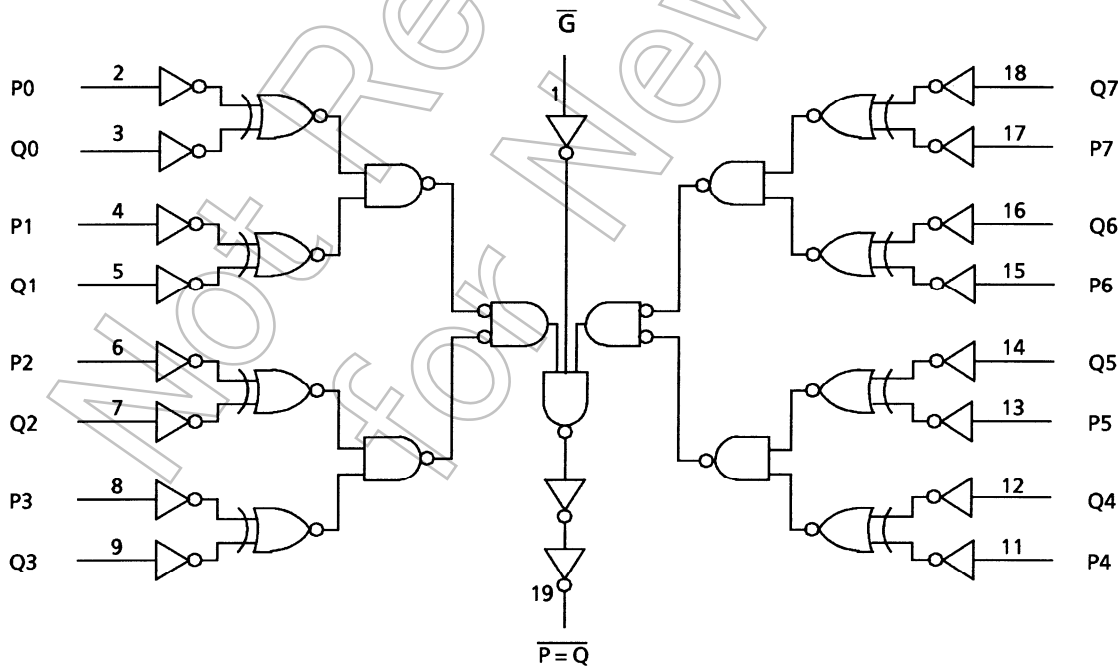


Truth Table

Inputs		Output
P, Q	$\overline{G}$	$P=Q$
P = Q	L	L
P $\neq$ Q	L	H
X	H	H

X: Don't care

System Diagram



Absolute Maximum Ratings (Note 1)

Characteristics	Symbol	Rating	Unit
Supply voltage range	V_{CC}	-0.5 to 7.0	V
DC input voltage	V_{IN}	-0.5 to $V_{CC} + 0.5$	V
DC output voltage	V_{OUT}	-0.5 to $V_{CC} + 0.5$	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}	± 100	mA
Power dissipation	P_D	500 (DIP) (Note 2)/180 (SOP)	mW
Storage temperature	T_{stg}	-65 to 150	°C

Note 1: Exceeding any of the absolute maximum ratings, even briefly, lead to deterioration in IC performance or even destruction.

Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings and the operating ranges.

Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc.).

Note 2: 500 mW in the range of $T_a = -40$ to 65°C . From $T_a = 65$ to 85°C a derating factor of $-10\text{ mW}/^\circ\text{C}$ should be applied up to 300 mW.

Operating Ranges (Note)

Characteristics	Symbol	Rating	Unit
Supply voltage	V_{CC}	2.0 to 5.5	V
Input voltage	V_{IN}	0 to V_{CC}	V
Output voltage	V_{OUT}	0 to V_{CC}	V
Operating temperature	T_{opr}	-40 to 85	°C
Input rise and fall time	dt/dV	0 to 100 ($V_{CC} = 3.3 \pm 0.3\text{ V}$) 0 to 20 ($V_{CC} = 5 \pm 0.5\text{ V}$)	ns/V

Note: The operating ranges must be maintained to ensure the normal operation of the device. Unused inputs must be tied to either V_{CC} or GND.

Electrical Characteristics

DC Characteristics

Characteristics	Symbol	Test Condition		Ta = 25°C			Ta = -40 to 85°C		Unit
				V _{CC} (V)	Min	Typ.	Max	Min	Max
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	— — —	V
High-level output voltage	V _{OH}	V _{IN} = V _{IH} or V _{IL}	I _{OH} = -50 µA	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} = -4 mA	3.0	2.58	—	—	2.48	
			I _{OH} = -24 mA	4.5	3.94	—	—	3.80	
			I _{OH} = -75 mA (Note)	5.5	—	—	—	3.85	
Low-level output voltage	V _{OL}	V _{IN} = V _{IH} or V _{IL}	I _{OL} = 50 µA	2.0 3.0 4.5	— — —	0.0 0.0 0.0	0.1 0.1 0.1	— — —	V
			I _{OL} = 12 mA	3.0	—	—	0.36	—	
			I _{OL} = 24 mA	4.5	—	—	0.36	—	
			I _{OL} = 75 mA (Note)	5.5	—	—	—	—	
								1.65	
Input leakage current	I _{IN}	V _{IN} = V _{CC} or GND		5.5	—	—	±0.1	—	µA
Quiescent supply current	I _{CC}	V _{IN} = V _{CC} or GND		5.5	—	—	8.0	—	µA

Note: This spec indicates the capability of driving 50 Ω transmission lines.

One output should be tested at a time for a 10 ms maximum duration.

AC Characteristics (C_L = 50 pF, R_L = 500 Ω, input: t_r = t_f = 3 ns)

Characteristics	Symbol	Test Condition		Ta = 25°C			Ta = -40 to 85°C		Unit
				V _{CC} (V)	Min	Typ.	Max	Min	Max
Propagation delay time (P _n , Q _n - P = Q)	t _{pLH}	—		3.3 ± 0.3	—	10.5	17.5	1.0	20.0
	t _{pHL}	—		5.0 ± 0.5	—	7.2	11.0	1.0	12.5
Propagation delay time ($\overline{G}$ - P = Q)	t _{pLH}	—		3.3 ± 0.3	—	7.2	11.5	1.0	13.0
	t _{pHL}	—		5.0 ± 0.5	—	4.8	7.0	1.0	8.0
Input capacitance	C _{IN}	—		—	—	5	10	—	pF
Power dissipation capacitance	C _{PD} (Note)	—		—	—	34	—	—	pF

Note: C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

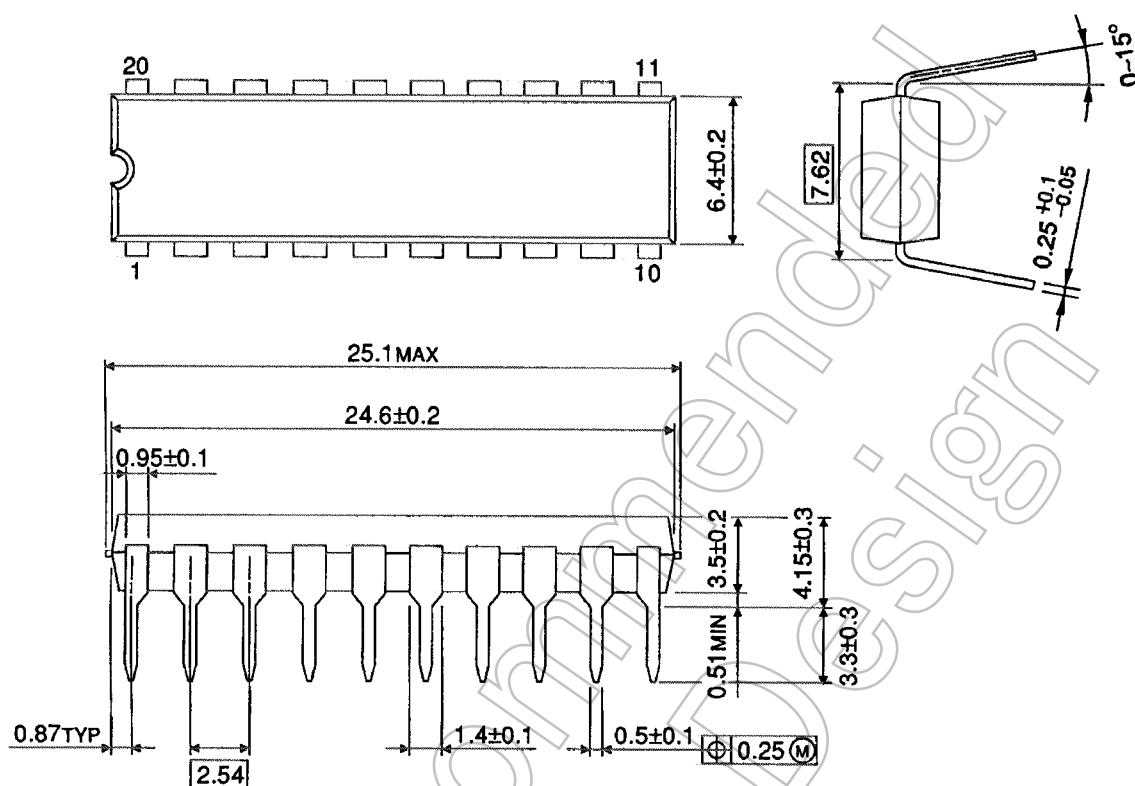
Average operating current can be obtained by the equation:

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

Package Dimensions

DIP20-P-300-2.54A

Unit : mm

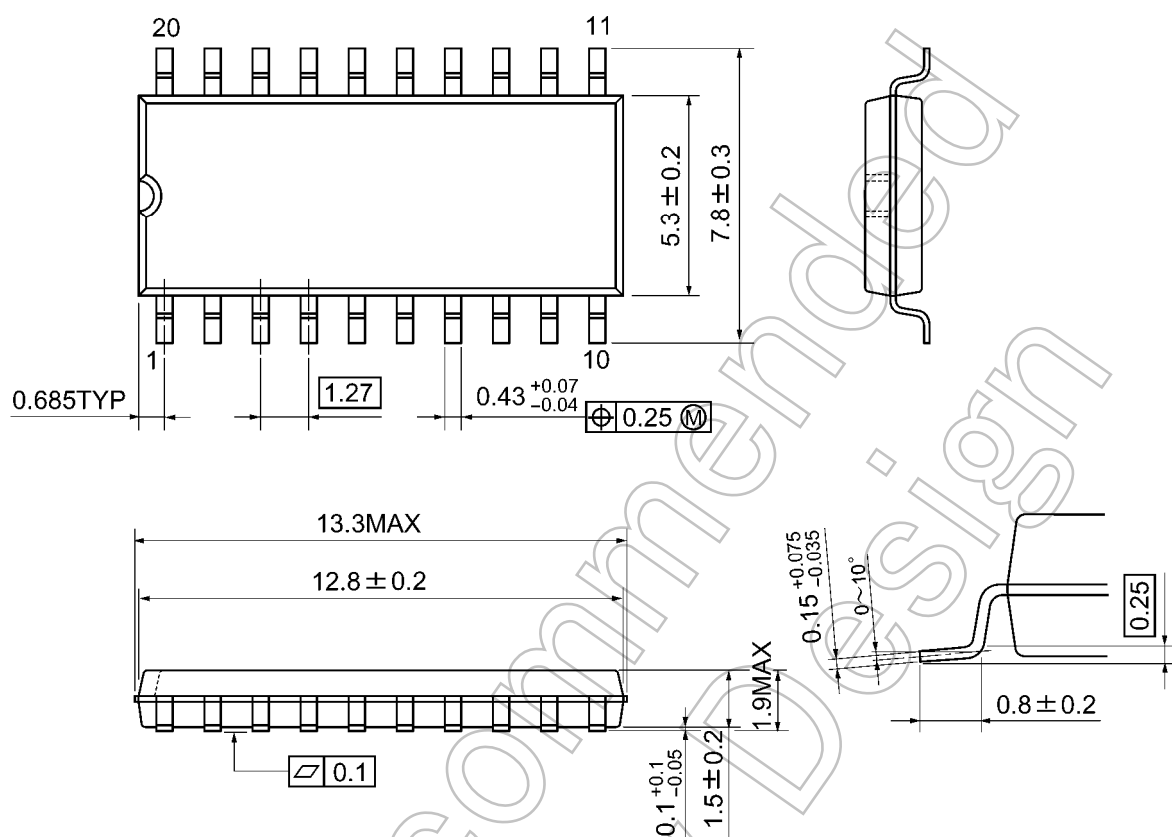


Weight: 1.30 g (typ.)

Package Dimensions

SOP20-P-300-1.27A

Unit: mm



Weight: 0.22 g (typ.)

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