National Semiconductor

74FCT521A
8-Bit Identity Comparator

General Description

The 'FCT521A is an expandable 8-bit comparator. It compares two words of up to eight bits each and provides a LOW output when the two words match bit for bit. The expansion input $\overline{I}_{A=B}$ also serves as an active LOW enable input.

FACT™ FCTA utilizes NSC quiet series technology to provide improved quiet output switching and dynamic threshold performance.
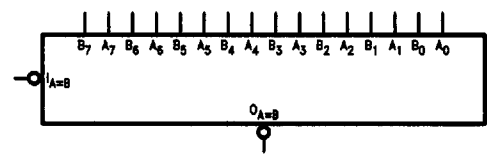
FACT FCTA features undershoot correction and split ground bus for superior performance.

Features

■ NSC 74FCT521A is pin and functionally equivalent to IDT 74FCT521A
■ Input clamp diodes to limit bus reflections
■ TTL/CMOS input and output level compatible
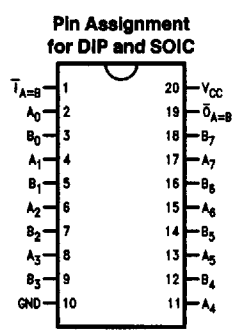■ I_{OL} = 48 mA
■ CMOS power levels
■ 4 kV minimum ESD immunity

Ordering Code: See Section 8

Logic Symbols

TL/F/10663–1

TL/F/10663–3

Connection Diagram

Pin Assignment for DIP and SOIC
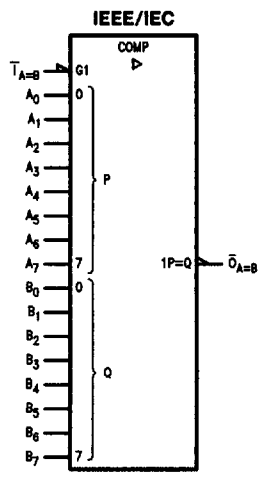
TL/F/10663–2

Pin Names	Description
A_0–A_7	Word A Inputs
B_0–B_7	Word B Inputs
$\overline{I}_{A=B}$	Expansion or Enable Input
$\overline{O}_{A=B}$	Identity Output

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Truth Table

Inputs		Outputs
$I_{A = B}$	A, B	$\overline{O}_{A = B}$
L	A = B*	L
L	A ≠ B	H
H	A = B*	H
H	A ≠ B	H

H = HIGH Voltage Level
L = LOW Voltage Level
*$A_0 = B_0$, $A_1 = B_1$, $A_2 = B_2$, etc.

Logic Diagram
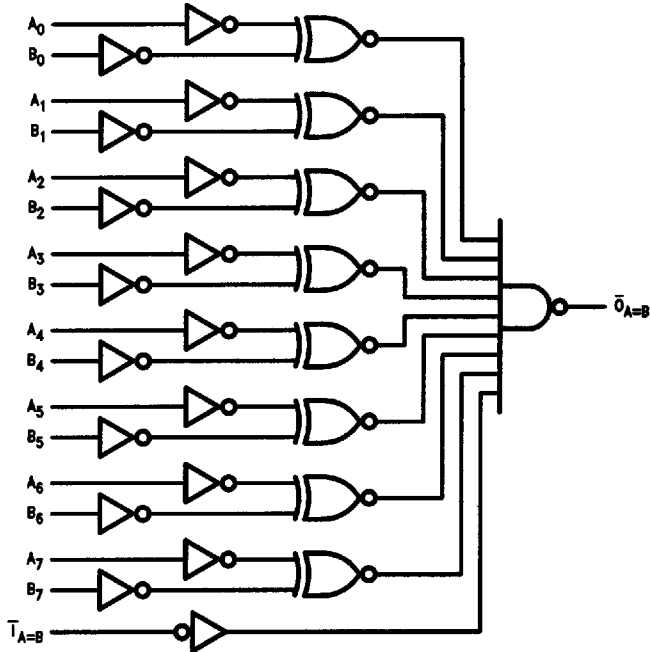
TL/F/10663–5

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

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Absolute Maximum Ratings

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Terminal Voltage with
Respect to GND (V_{TERM})
74FCTA $-0.5V$ to $+7.0V$

Temperature under Bias (T_{BIAS})
74FCTA $-55°C$ to $+125°C$

Storage Temperature (T_{STG})
74FCTA $-55°C$ to $+125°C$

DC Output Current ((I_{OUT}))   120 mA

Note 1: Absolute maximum ratings are those values beyond which damage to the device may occur. Exposure to absolute maximum ratings conditions for extended periods may affect reliability. The databook specifications should be met, without exception, to ensure that the system design is reliable over its power supply, temperature, and output/input loading variables.

Recommended Operating Conditions

Supply Voltage (V_{CC})
74FCTA   4.75V to 5.25V

Input Voltage   0V to V_{CC}

Output Voltage   0V to V_{CC}

Operating Temperature (T_A)
74FCTA $-0°C$ to $+70°C$

Junction Temperature (T_J)
PDIP   140°C

Note: All commercial packaging is not recommended for applications requiring greater than 2000 temperature cycles from $-40°C$ to $+125°C$.

DC Characteristics for 'FCTA Family Devices

Typical values are at $V_{CC} = 5.0V$, 25°C ambient and maximum loading. For test conditions shown as Max, use the value specified for the appropriate device type: Com: $V_{CC} = 5.0V \pm 5\%$, $T_A = 0°C$ to $+70°C$; $V_{HC} = V_{CC} - 0.2V$

Symbol	Parameter	74FCTA			Units	Conditions	
		Min	Typ	Max			
V_{IH}	Minimum High Level Input Voltage	2.0			V		
V_{IL}	Maximum Low Level Input Voltage			0.8	V		
I_{IH}	Input High Current			5.0 5.0	μA	$V_{CC} = Max$	$V_I = V_{CC}$ $V_I = 2.7V$ (Note 2)
I_{IL}	Input Low Current			-5.0 -5.0	μA	$V_{CC} = Max$	$V_I = 0.5V$ (Note 2) $V_I = GND$
V_{IK}	Clamp Diode Voltage		-0.7	-1.2	V	$V_{CC} = Min$; $I_{IN} = -18$ mA	
I_{OS}	Short Circuit Current	-60	-120		mA	$V_{CC} = Max$ (Note 1); $V_O = GND$	
V_{OH}	Minimum High Level Output Voltage	2.8	3.0		V	$V_{CC} = 3V$; $V_{IN} = 0.2V$ or V_{HC}; $I_{OH} = -32 \mu A$	
		V_{HC} 2.4	V_{CC} 4.3			$V_{CC} = Min$ $V_{IN} = V_{IH}$ or V_{IL}	$I_{OH} = -300 \mu A$ $I_{OL} = -15$ mA
V_{OL}	Maximum Low Level Output Voltage		GND	0.2	V	$V_{CC} = 3V$; $V_{IN} = 0.2V$ or V_{HC}; $I_{OL} = 300 \mu A$	
			GND 0.3	0.2 0.5		$V_{CC} = Min$ $V_{IN} = V_{IH}$ or V_{IL}	$I_{OH} = 300 \mu A$ $I_{OL} = 48$ mA
I_{CC}	Maximum Quiescent Supply Current		0.2	1.5	mA	$V_{CC} = Max$ $V_{IN} \geq V_{HC}$, $V_{IN} \leq 0.2V$ $f_I = 0$	
ΔI_{CC}	Quiescent Supply Current; TTL Inputs HIGH		0.5	2.0	mA	$V_{CC} = Max$ $V_{IN} = 3.4V$ (Note 3)	
I_{CCD}	Dynamic Power Supply Current (Note 4)			0.35	mA/MHz	$V_{CC} = Max$ Outputs Open One Input Toggling 50% Duty Cycle	$V_{IN} \geq V_{HC}$ $V_{IN} \leq 0.2V$

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DC Characteristics for 'FCTA Family Devices (Continued)

Typical values are at V_{CC} = 5.0V, 25°C ambient and maximum loading. For test conditions shown as Max, use the value specified for the appropriate device type: Com: V_{CC} = 5.0V ±5%, T_A = 0°C to +70°C; V_{HC} = V_{CC} − 0.2V

Symbol	Parameter	74FCTA			Units	Conditions	
		Min	Typ	Max			
I_C	Total Power Supply Current (Note 6)			4.0	mA	V_{CC} = Max Outputs Open	$V_{IN} \geq V_{HC}$ $V_{IN} \leq 0.2V$
				5.0		f_I = 10 MHz One Bit Toggling 50% Duty Cycle	V_{IN} = 3.4V V_{IN} = GND

Note 1: Maximum test duration not to exceed one second, not more than one output shorted at one time.

Note 2: This parameter guaranteed but not tested.

Note 3: Per TTL driven input (V_{IN} = 3.4V); all other inputs at V_{CC} or GND.

Note 4: This parameter is not directly testable, but is derived for use in Total Power Supply calculations.

Note 5: Values for these conditions are examples of the I_{CC} formula. These limits are guaranteed but not tested.

Note 6: $I_C = I_{QUIESCENT} + I_{INPUTS} + I_{DYNAMIC}$

$I_C = I_{CC} + \Delta I_{CC} D_H N_T + I_{CCD} (f_{CP}/2 + f_I N_I)$

I_{CC} = Quiescent Current

ΔI_{CC} = Power Supply Current for a TTL High Input (V_{IN} = 3.4V)

D_H = Duty Cycle for TTL Inputs High

N_T = Number of Inputs at D_H

I_{CCD} = Dynamic Current Caused by an Input Transition Pair (HLH or LHL)

f_{CP} = Clock Frequency for Register Devices (Zero for Non-Register Devices)

f_I = Input Frequency

N_I = Number of Inputs at f_I

All currents are in milliamps and all frequencies are in megahertz.

AC Electrical Characteristics: See Section 2

Symbol	Parameter	Test Conditions	74FCT T_A, V_{CC} = Com R_L = 500Ω C_L = 50 pF (Note 1)		Units	Fig. No.
			Min	Max		
t_{PLH} t_{PHL}	Propagation Delay A_n or B_n to $\overline{O}_{A=B}$	C_L = 50 pF R_L = 500Ω	1.5	7.2	ns	2-9
t_{PLH} t_{PHL}	Propagation Delay $\overline{I}_{A=B}$ to $\overline{O}_{A=B}$	C_L = 50 pF R_L = 500Ω	1.5	6.0	ns	2-9

Note 1: Minimum limits guaranteed but not tested on propagation delays.

Capacitance (T_A = +25°C, f = 1.0 MHz)

Symbol	Parameter(1)	Conditions	Typ	Max	Unit
C_{IN}	Input Capacitance	V_{IN} = 0V	6	10	pF
C_{OUT}	Output Capacitance	V_{OUT} = 0V	8	12	pF

Note 1: This parameter is measured at characterization but not tested.