



# FAST CMOS 8-BIT IDENTITY COMPARATOR

**IDT54/74FCT521T/AT/BT/CT**

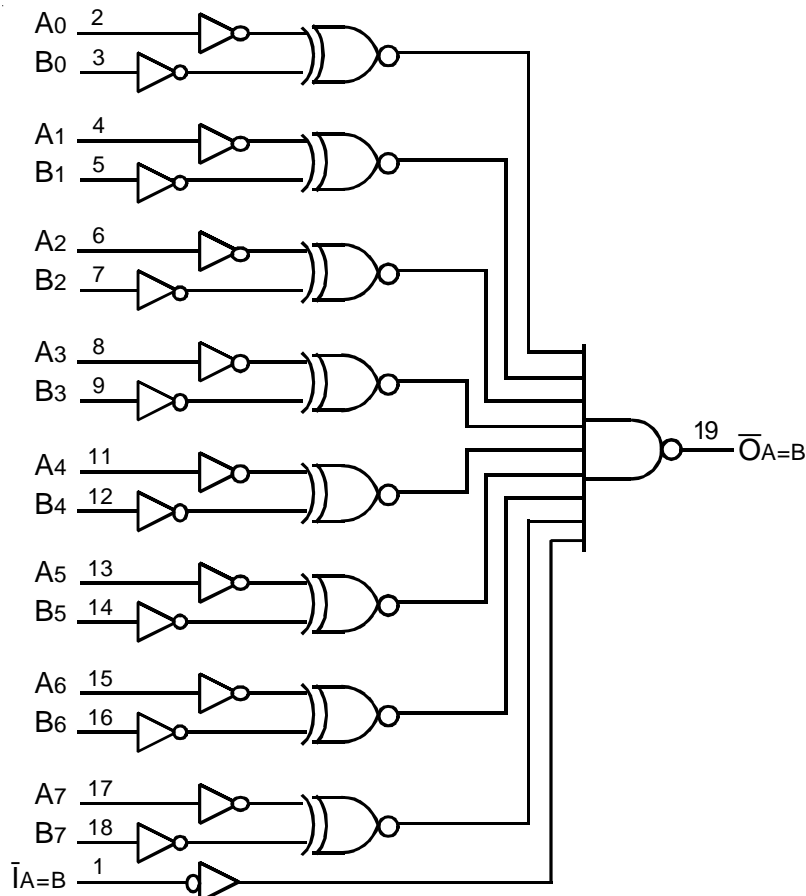
## FEATURES:

- Std., A, B, and C grades
- Low input and output leakage  $\leq 1\mu\text{A}$  (max.)
- CMOS power levels
- True TTL input and output compatibility:
  - $V_{OH} = 3.3V$  (typ.)
  - $V_{OL} = 0.3V$  (typ.)
- High Drive outputs (-15mA  $I_{OH}$ , 48mA  $I_{OL}$ )
- Meets or exceeds JEDEC standard 18 specifications
- Military product compliant to MIL-STD-883, Class B and DESC listed (dual marked)
- Power off disable outputs permit "live insertion"
- Available in the following packages:
  - Industrial: SOIC, SSOP, QSOP
  - Military: CERDIP, LCC

## DESCRIPTION:

The IDT54/74FCT521T is an 8-bit identity comparator built using an advanced dual metal CMOS technology. These devices compare two words of up to eight bits each and provide a low output when the two words match bit for bit. The expansion input  $\bar{I}A = B$  also serves as an active low enable input.

## FUNCTIONAL BLOCK DIAGRAM

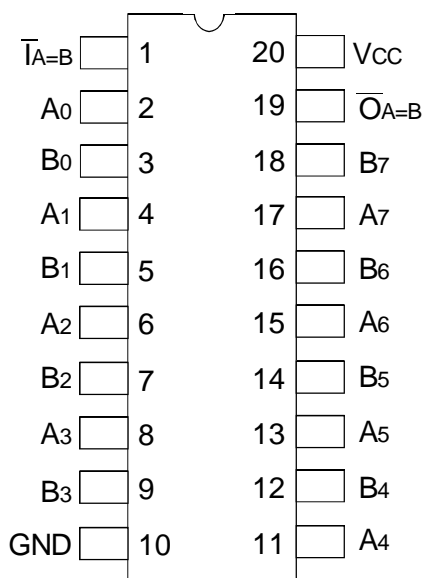


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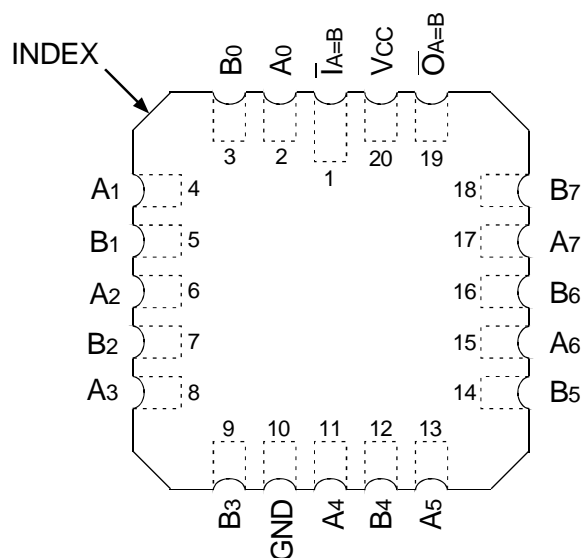
MILITARY AND INDUSTRIAL TEMPERATURE RANGES

JUNE 2002

## PIN CONFIGURATION



CERDIP/ SOIC/ SSOP/ QSOP  
TOP VIEW



LCC  
TOP VIEW

## ABSOLUTE MAXIMUM RATINGS<sup>(1)</sup>

Symbol	Description	Max	Unit
VTERM <sup>(2)</sup>	Terminal Voltage with Respect to GND	-0.5 to +7	V
VTERM <sup>(3)</sup>	Terminal Voltage with Respect to GND	-0.5 to VCC+0.5	V
TSTG	Storage Temperature	-65 to +150	°C
IOUT	DC Output Current	-60 to +120	mA

### NOTES:

- Stresses greater than those listed under ABSOLUTE MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability. No terminal voltage may exceed Vcc by +0.5V unless otherwise noted.
- Inputs and Vcc terminals only.
- Output and I/O terminals only.

## CAPACITANCE (TA = +25°C, F = 1.0MHz)

Symbol	Parameter <sup>(1)</sup>	Conditions	Typ.	Max.	Unit
CIN	Input Capacitance	VIN = 0V	6	10	pF
COUT	Output Capacitance	VOUT = 0V	8	12	pF

### NOTE:

- This parameter is measured at characterization but not tested.

## PIN DESCRIPTION

Pin Names	Description
A0 - A7	Word A Inputs
B0 - B7	Word B Inputs
IA = B	Expansion or Enable Input (Active LOW)
OA = B	Identity Output (Active LOW)

## FUNCTION TABLE<sup>(1)</sup>

Inputs		Output
IA = B	A, B	OA = B
L	A = B*	L
L	A ≠ B	H
H	A = B*	H
H	A ≠ B	H

### NOTE:

- H = HIGH Voltage Level  
L = LOW Voltage Level  
\*A0 = B0, A1 = B1, A2 = B2, etc.

## DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Following Conditions Apply Unless Otherwise Specified:

Industrial:  $T_A = -40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ ,  $V_{CC} = 5.0\text{V} \pm 5\%$ ; Military:  $T_A = -55^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$ ,  $V_{CC} = 5.0\text{V} \pm 10\%$

Symbol	Parameter	Test Conditions <sup>(1)</sup>		Min.	Typ. <sup>(2)</sup>	Max.	Unit
$V_{IH}$	Input HIGH Level	Guaranteed Logic HIGH Level		2	—	—	V
$V_{IL}$	Input LOW Level	Guaranteed Logic LOW Level		—	—	0.8	V
$I_{IH}$	Input HIGH Current <sup>(4)</sup>	$V_{CC} = \text{Max.}$	$V_I = 2.7\text{V}$	—	—	$\pm 1$	$\mu\text{A}$
$I_{IL}$	Input LOW Current <sup>(4)</sup>	$V_{CC} = \text{Max.}$	$V_I = 0.5\text{V}$	—	—	$\pm 1$	$\mu\text{A}$
$I_I$	Input HIGH Current <sup>(4)</sup>	$V_{CC} = \text{Max.}, V_I = V_{CC} (\text{Max.})$		—	—	$\pm 1$	$\mu\text{A}$
$V_{IK}$	Clamp Diode Voltage	$V_{CC} = \text{Min.}, I_{IN} = -18\text{mA}$		—	-0.7	-1.2	V
$I_{OS}$	Short Circuit Current	$V_{CC} = \text{Max.}, V_O = \text{GND}^{(3)}$		-60	-120	-225	mA
$V_{OH}$	Output HIGH Voltage	$V_{CC} = \text{Min}$ $V_{IN} = V_{IH}$ or $V_{IL}$	$I_{OH} = -6\text{mA MIL}$ $I_{OH} = -8\text{mA IND}$	2.4	3.3	—	V
			$I_{OH} = -12\text{mA MIL}$ $I_{OH} = -15\text{mA IND}$	2	3	—	
$V_{OL}$	Output LOW Voltage	$V_{CC} = \text{Min}$ $V_{IN} = V_{IH}$ or $V_{IL}$	$I_{OL} = 32\text{mA MIL}$ $I_{OL} = 48\text{mA IND}$	—	0.3	0.5	V
$V_H$	Input Hysteresis	—		—	200	—	mV
$I_{CC}$	Quiescent Power Supply Current	$V_{CC} = \text{Max.}$ $V_{IN} = \text{GND}$ or $V_{CC}$		—	0.01	1	mA

### NOTES:

- For conditions shown as Min. or Max., use appropriate value specified under Electrical Characteristics for the applicable device type.
- Typical values are at  $V_{CC} = 5.0\text{V}$ ,  $+25^{\circ}\text{C}$  ambient.
- Not more than one output should be tested at one time. Duration of the test should not exceed one second.
- The test limit for this parameter is  $\pm 5\mu\text{A}$  at  $T_A = -55^{\circ}\text{C}$ .

## POWER SUPPLY CHARACTERISTICS

Symbol	Parameter	Test Conditions <sup>(1)</sup>		Min.	Typ. <sup>(2)</sup>	Max.	Unit
$\Delta I_{CC}$	Quiescent Power Supply Current TTL Inputs HIGH	$V_{CC} = \text{Max.}$ $V_{IN} = 3.4V^{(3)}$		—	0.5	2	mA
$I_{CCD}$	Dynamic Power Supply Current <sup>(4)</sup>	$V_{CC} = \text{Max.}$ Outputs Open One Input Toggling 50% Duty Cycle	$V_{IN} = V_{CC}$ $V_{IN} = \text{GND}$	—	0.15	0.25	mA/ MHz
$I_C$	Total Power Supply Current <sup>(6)</sup>	$V_{CC} = \text{Max.}$ Outputs Open $f_i = 10\text{MHz}$ One Bit Toggling 50% Duty Cycle	$V_{IN} = V_{CC}$ $V_{IN} = \text{GND}$	—	1.5	3.5	mA
			$V_{IN} = 3.4V$ $V_{IN} = \text{GND}$	—	1.8	4.5	

### NOTES:

1. For conditions shown as Min. or Max., use appropriate value specified under Electrical Characteristics for the applicable device type.

2. Typical values are at  $V_{CC} = 5.0V$ ,  $+25^\circ\text{C}$  ambient.

3. Per TTL driven input; ( $V_{IN} = 3.4V$ ). All other inputs at  $V_{CC}$  or  $\text{GND}$ .

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

5. Values for these conditions are examples of  $\Delta I_{CC}$  formula. These limits are guaranteed but not tested.

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

$\Delta I_{CC}$  = Power Supply Current for a TTL High Input ( $V_{IN} = 3.4V$ )

$D_H$  = Duty Cycle for TTL Inputs High

$N_T$  = Number of TTL 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)

$f_i$  = Output Frequency

$N_i$  = Number of Outputs at  $f_i$

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

## SWITCHING CHARACTERISTICS OVER OPERATING RANGE - INDUSTRIAL

Symbol	Parameter	Condition <sup>(1)</sup>	FCT521AT		FCT521CT		Unit
			Min. <sup>(2)</sup>	Max.	Min. <sup>(2)</sup>	Max.	
$t_{PLH}$	Propagation Delay	$C_L = 50\text{pF}$ $R_L = 500\Omega$	1.5	7.2	1.5	4.5	ns
$t_{PHL}$	Ax or Bx to $\bar{O}_A = B$						
$t_{PLH}$	Propagation Delay	$\bar{I}_A = B$ to $\bar{O}_A = B$	1.5	6	1.5	4.1	ns
$t_{PHL}$							

## SWITCHING CHARACTERISTICS OVER OPERATING RANGE - MILITARY

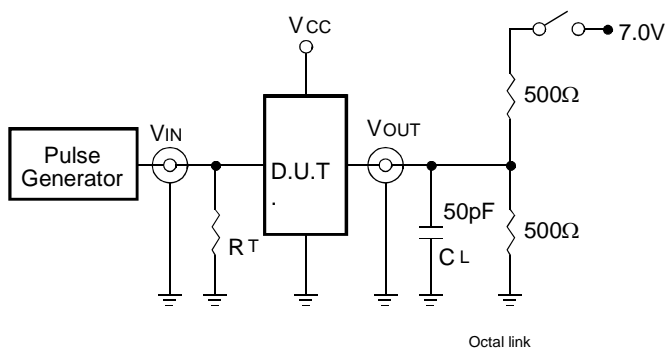
Symbol	Parameter	Condition <sup>(1)</sup>	54FCT521T		54FCT521AT		54FCT521BT		54FCT521CT		Unit
			Min. <sup>(2)</sup>	Max.	Min. <sup>(2)</sup>	Max.	Min. <sup>(2)</sup>	Max.	Min. <sup>(2)</sup>	Max.	
$t_{PLH}$	Propagation Delay	$C_L = 50\text{pF}$ $R_L = 500\Omega$	1.5	15	1.5	9.5	1.5	7.3	1.5	5.1	ns
$t_{PHL}$	Ax or Bx to $\bar{O}_A = B$										
$t_{PLH}$	Propagation Delay	$\bar{I}_A = B$ to $\bar{O}_A = B$	1.5	9	1.5	7.8	1.5	6	1.5	4.5	ns
$t_{PHL}$											

### NOTES:

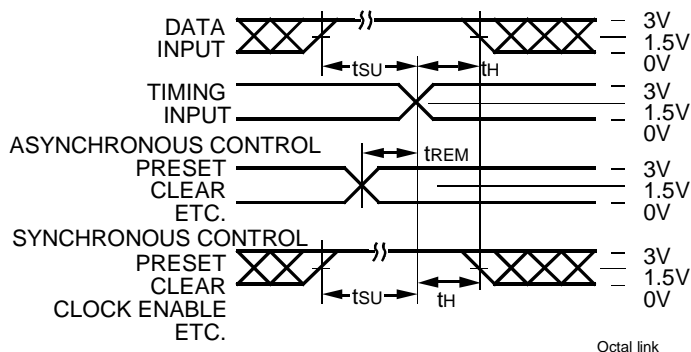
1. See test circuit and waveforms.

2. Minimum limits are guaranteed but not tested on Propagation Delays.

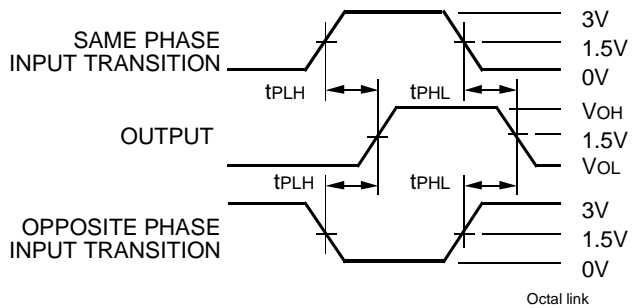
## TEST CIRCUITS AND WAVEFORMS



Test Circuits for All Outputs



Set-Up, Hold, and Release Times



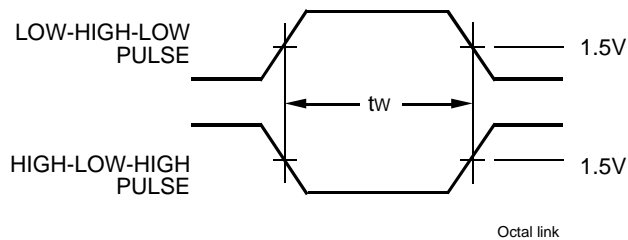
Propagation Delay

## SWITCH POSITION

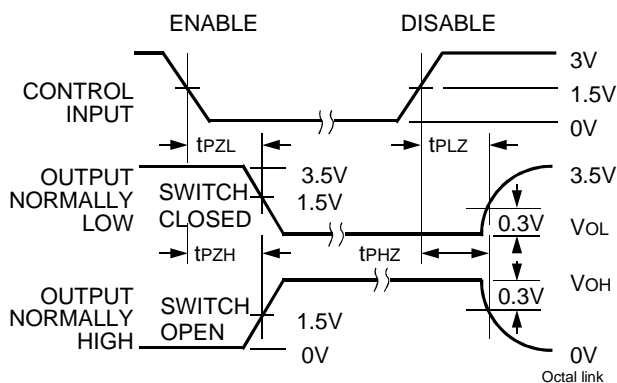
Test	Switch
Open Drain Disable Low Enable Low	Closed
All Other Tests	Open

### DEFINITIONS:

CL = Load capacitance: includes jig and probe capacitance.  
RT = Termination resistance: should be equal to ZOUT of the Pulse Generator.



Pulse Width

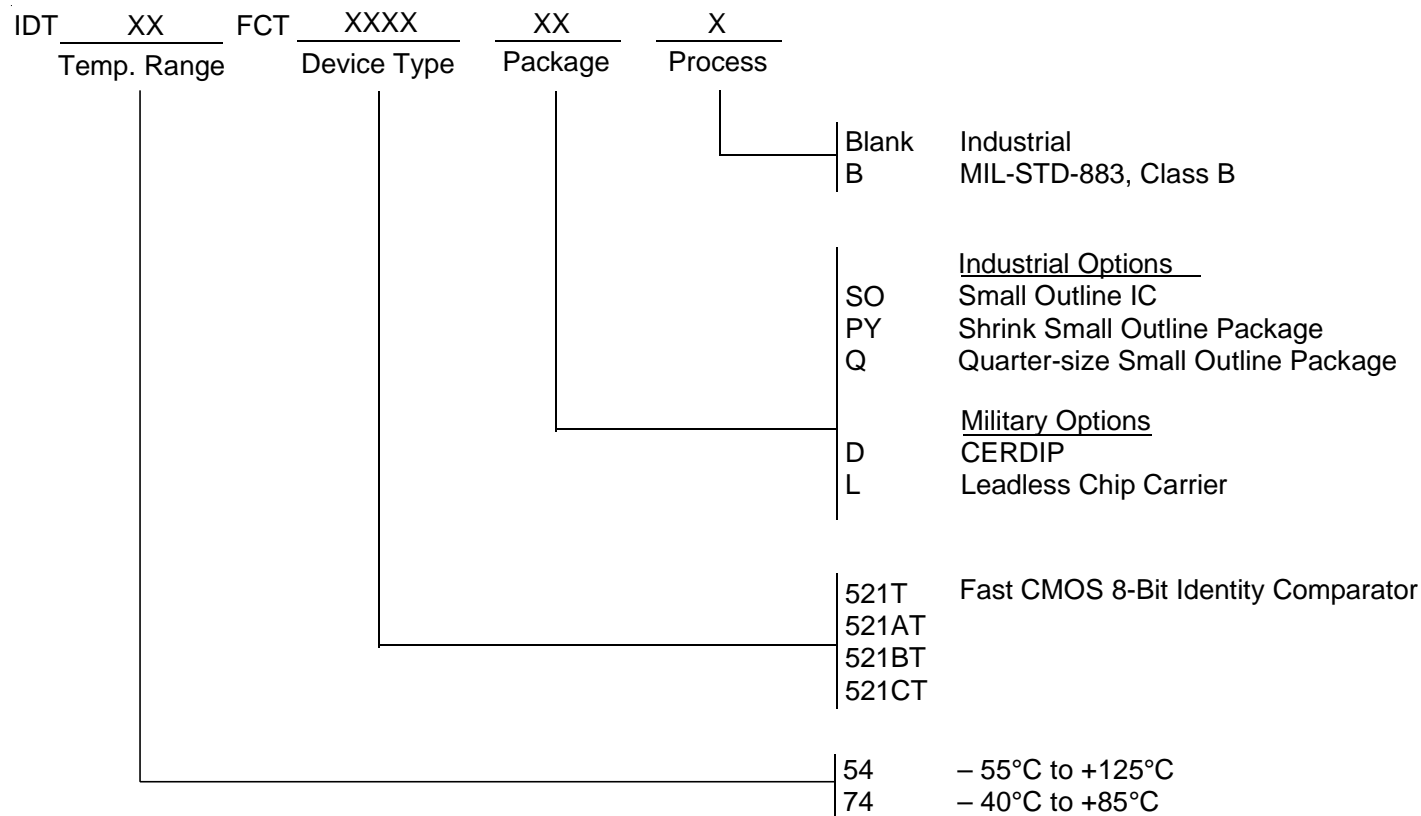


Enable and Disable Times

### NOTES:

- Diagram shown for input Control Enable-LOW and input Control Disable-HIGH.
- Pulse Generator for All Pulses: Rate  $\leq$  1.0MHz;  $t_r \leq$  2.5ns;  $t_f \leq$  2.5ns.

## ORDERING INFORMATION



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