



# High Speed CMOS 8-Bit Identity Comparator

QS54/74FCT521T

QS54/74FCT2521T

## FEATURES/BENEFITS

- Pin and function compatible to the 74F521, 74FCT521, and 74ALS521
- CMOS power levels: <7.5 mW static
- Available in DIP, SOIC, QSOP, ZIP, HQSOP
- Undershoot clamp diodes on all inputs
- TTL-compatible input and output levels
- Ground bounce controlled outputs
- Reduced output swing of 0-3.5V
- Military product compliant to MIL-STD-883

### FCT-T 521T

- JEDEC-FCT spec compatible
- Fastest CMOS logic family available
- Standard thru D speed grades; 3.9 ns  $t_{PD}$  for D
- $I_{OL} = 48$  mA Com., 32 mA Mil.

### FCT-T 2521T

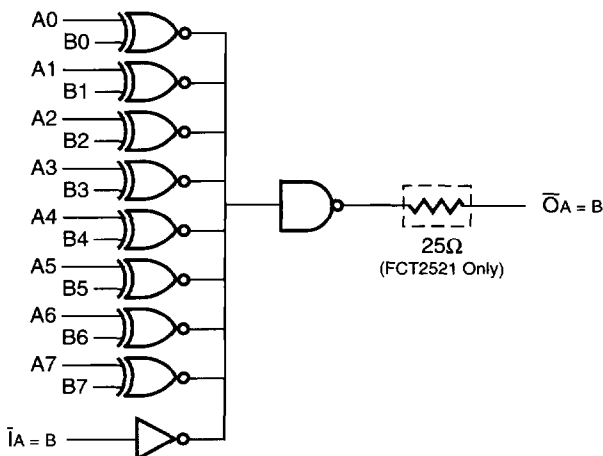
- Built-in  $25\Omega$  series resistor outputs reduce reflection and other system noise
- Standard thru D speed grades; 3.9 ns  $t_{PD}$  for D
- $I_{OL} = 12$  mA Com.



## DESCRIPTION

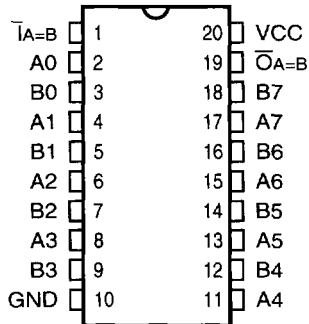
The QSFC521 and QSFC2521 are high-speed CMOS TTL-compatible 8-bit identity comparators. Two words of up to eight bits are compared and a low output is provided when the words match. An expansion input allows the comparison to be extended over multiple words. All inputs have clamp diodes for undershoot noise suppression. All outputs have ground bounce suppression (see QSI Application Note AN-001).

## FUNCTIONAL BLOCK DIAGRAM

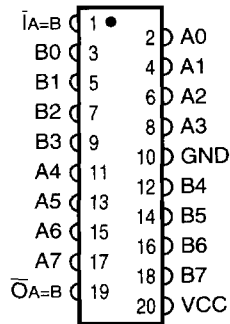


**PIN CONFIGURATIONS (All Pins Top View)**

**PDIP, SOIC, QSOP, HQSOP**



**ZIP**



**PIN DESCRIPTION**

Name	I/O	Description
A7-A0	I	Word A
B7-B0	I	Word B
$\bar{I}_A = B$	I	Expansion or Enable Input
$\bar{O}_A = B$	O	Compare Output

**FUNCTION TABLE**

Inputs		Outputs		Function
A7-A0, B7-B0	$\bar{I}_A = B$	$\bar{O}_A = B$		
A7-A0 = B7-B0	L	L		Compare Equal
A7-A0 $\neq$ B7-B0	L	H		Compare Not Equal
X	H	H		Expand Input Not Valid

**ABSOLUTE MAXIMUM RATINGS**

Supply Voltage to Ground .....	-0.5V to +7.0V
DC Output Voltage $V_{OUT}$ .....	-0.5V to +7.0V
DC Input Voltage $V_{IN}$ .....	-0.5V to +7.0V
AC Input Voltage (for a pulse width $\leq 20$ ns) .....	-3.0V
DC Input Diode Current with $V_{IN} < 0$ .....	-20 mA
DC Output Diode Current with $V_{OUT} < 0$ .....	-50 mA
DC Output Current Max. Sink Current/Pin .....	120 mA
Maximum Power Dissipation .....	0.5 watts
$T_{STG}$ Storage Temperature .....	-65° to +150°C

**Note:** Stresses greater than those listed under ABSOLUTE MAXIMUM RATINGS may cause permanent damage to QSI devices that result in functional or reliability type failures.

**CAPACITANCE**

$T_A = 25^\circ\text{C}$ ,  $f = 1$  MHz,  $V_{IN} = 0\text{V}$ ,  $V_{OUT} = 0\text{V}$

Pins	SOIC	QSOP	PDIP	ZIP	Unit
1-9, 11-18	4	4	5	7	pF
19	6	6	7	9	pF
—	8	8	9	10	pF

**Note:** Capacitance is characterized but not tested.

**POWER SUPPLY CHARACTERISTICS**

Symbol	Parameter	Test Conditions <sup>(1)</sup>	Min	Max	Unit
$I_{CC}$	Quiescent Power Supply Current	$V_{CC} = \text{Max.}$ , freq = 0 $0\text{V} \leq V_{IN} \leq 0.2\text{V}$ or $V_{CC}-0.2\text{V} \leq V_{IN} \leq V_{CC}$	—	1.5	mA
$\Delta I_{CC}$	Supply Current per Input @ TTL HIGH	$V_{CC} = \text{Max.}$ , $V_{IN} = 3.4\text{V}$ , freq = 0 <sup>(2)</sup>	—	2.0	mA
$Q_{CCD}$	Supply Current per Input per MHz	$V_{CC} = \text{Max.}$ , Outputs open and enabled One bit toggling @ 50% duty cycle Other inputs at GND or $V_{CC}$ <sup>(3,4)</sup>	—	0.25	mA/ MHz

**Notes:**

- For conditions shown as Min. or Max., use the appropriate values specified under DC specifications.
- Per TTL driven input ( $V_{IN} = 3.4\text{V}$ ).
- For flip-flops,  $Q_{CCD}$  is measured by switching one of the data input pins so that the output changes every clock cycle. This is a measurement of device power consumption only and does not include power to drive load capacitance or tester capacitance. This parameter is guaranteed by design but not tested.
- $I_C$  can be computed using the above parameters as explained in the Technical Overview section.

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## QSFCT521T, 2521T

### DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Commercial  $T_A = 0^\circ\text{C}$  to  $70^\circ\text{C}$ ,  $V_{CC} = 5.0\text{V} \pm 5\%$

Military  $T_A = -55^\circ\text{C}$  to  $125^\circ\text{C}$ ,  $V_{CC} = 5.0\text{V} \pm 10\%$

Symbol	Parameter	Test Conditions	Min	Typ <sup>(1)</sup>	Max	Unit
$V_{IH}$	Input HIGH Voltage	Logic HIGH for All Inputs	2.0	—	—	V
$V_{IL}$	Input LOW Voltage	Logic LOW for All Inputs	—	—	0.8	V
$\Delta V_T$	Input Hysteresis	$V_{TLH} - V_{THL}$ for All Inputs	—	0.2	—	V
$ I_{IH} $ $ I_{IL} $	Input Current Input HIGH or LOW	$V_{CC} = \text{Max.}, 0 \leq V_{IN} < V_{CC}$	—	—	5	$\mu\text{A}$
$ I_{OZ} $	Off-State Output Current (Hi-Z)	$V_{CC} = \text{Max.}, 0 \leq V_{IN} \leq V_{CC}$	—	—	5	$\mu\text{A}$
$I_{OS}$	Short Circuit Current (FCTXXX)	$V_{CC} = \text{Max.}, V_{OUT} = \text{GND}^{(2,3)}$	-60	—	—	mA
$I_{OR}$	Current Drive (FCT2XXX - 25 $\Omega$ )	$V_{CC} = \text{Min.}, V_{OUT} = 2.0\text{V}^{(3)}$	50	—	—	mA
$V_{IC}$	Input Clamp Voltage	$V_{CC} = \text{Min.}, I_{IN} = -18 \text{ mA}, T_A = 25^\circ\text{C}^{(3)}$	—	-0.7	-1.2	V
$V_{OH}$	Output HIGH Voltage	$V_{CC} = \text{Min.}$ $I_{OH} = -12 \text{ mA (MIL)}$ $I_{OH} = -15 \text{ mA (COM)}$	2.4 2.4	—	—	V
$V_{OL}$	Output LOW Voltage (FCTXXX)	$V_{CC} = \text{Min.}$ $I_{OL} = 32 \text{ mA (MIL)}$ $I_{OL} = 48 \text{ mA (COM)}$	— —	—	0.50 0.50	V
$V_{OL}$	Output LOW Voltage (FCT2XXX - 25 $\Omega$ )	$V_{CC} = \text{Min.}$ $I_{OL} = 12 \text{ mA (MIL)}$ $I_{OL} = 12 \text{ mA (COM)}$	— —	—	0.50 0.50	V
$R_{OUT}$	Output Resistance (FCT2XXX - 25 $\Omega$ )	$V_{CC} = \text{Min.}$ $I_{OL} = 12 \text{ mA (MIL)}$ $I_{OL} = 12 \text{ mA (COM)}$	— 20	25 28	— 40	$\Omega$

**Notes:**

1. Typical values indicate  $V_{CC} = 5.0\text{V}$  and  $T_A = 25^\circ\text{C}$ .
2. Not more than one output should be shorted and the duration is  $\leq 1$  second.
3. These parameters are guaranteed by design but not tested.

### SWITCHING CHARACTERISTICS OVER OPERATING RANGE

Commercial  $T_A = 0^\circ\text{C}$  to  $70^\circ\text{C}$ ,  $V_{CC} = 5.0\text{V} \pm 5\%$

Military  $T_A = -55^\circ\text{C}$  to  $125^\circ\text{C}$ ,  $V_{CC} = 5.0\text{V} \pm 10\%$

$C_{LOAD} = 50 \text{ pF}$ ,  $R_{LOAD} = 500\Omega$  unless otherwise noted.

Symbol	Description <sup>(1)</sup>		521T 2521T		521AT 2521AT		521BT 2521BT		521CT 2521CT		521DT 2521DT		Unit
			Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	
$t_{PHL}$	Propagation Delay	COM	1.5	11	1.5	7.2	1.5	5.5	1.5	4.5	1.5	4.1	ns
$t_{PLH}$	$A_i = B_i$ to $\bar{O}_A = B$	MIL	1.5	15	1.5	9.5	1.5	7.3	1.5	5.1	—	—	ns
$t_{PHLX}$	Propagation Delay	COM	1.5	10	1.5	6	1.5	4.6	1.5	4.1	1.5	3.9	ns
$t_{PLHX}$	$\bar{I}_A = B$ to $\bar{O}_A = B$	MIL	1.5	9	1.5	7.8	1.5	6.0	1.5	4.5	—	—	ns

**Notes:**

1. Minimum guaranteed but not tested.